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NATIONAL CONFERENCE ON MANAGING THE ENVIRONMENT

Kenneth E. Boulding

Washington Environmental Research Center

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FINAL CONFERENCE REPORT FOR THE NATIONAL CONFERENCE ON MANAGING THE ENVIRONMENT

Project Officer

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REFLECTIONS

By Kenneth E. Boulding

at the National Conference on Managing the Environment

The movement for environment has been a big success
For people have become aware of rapid growth of mess.
And in the halls of Congress the environmental boys
Have legislated water, air, and pesticides and noise;

Now monitoring is the key to quality control,
Unless we know which way is up it's hard to reach a goal -
But the most effective monitor is public agitation
To keep a narrow expertise from governing the nation.

The involuntary system that is based upon the cell
Can manage billions of parts and do it very well,
So perhaps it's the development of arrogance of brain
That brings along environmental troubles in its train.

Environmental planning must be based upon a region
And even there phenomena are virtually legion,
And so the poor environmentalist is very very loath
To contemplate the consequence of exponential growth.

Equilibrium's a fiction of the ordered human mind
In the turbulence of nature it is very hard to find,
So we have to ride the rapids of a raging evolution
In the hope that our extinction isn't part of the solution.

The quiet revolution of the planning of the land,
At the state and local level may be very well in hand
But one may have nagging doubts on whether guiding growth in quality,
Is much within the power of any level of the polity.

As we don't know very clearly what we really want to do,
It would be dangerous to have too clear an end in view,
But if we can put a stopper on the scandalous and outrageous,
We may create a state of things where virtue is contagious.

A modest optimism may be entertained because
The air above the city streets is better than it was,
But one can permit some gloom about an ultimate solution
When the GNP's a symbol for Gross National Pollution.

A careful city government that sensitive and nervous is
Will pretty well confine itself to just providing services;
But if it gets courageous it may ferret out a new way
To defend its threatened people from invasion by a throughway.

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FORWARD

Increasing attention has been focused on the environment as a public policy issue. In addressing that issue, public officials are faced with the question: how can government be more effective in managing the environment? For many years, various federal, state and local governments have reorganized themselves and used various management techniques for addressing environmental problems. Since 1969, however, dramatic organizational and legislative actions have occurred in response to environmental problems. The most significant actions are the National Environmental Policy Act (NEPA) of 1969, which created the President's Council on Environmental Quality (CEQ); the creation of the U.S. Environmental Protection Agency (EPA) by Executive Order; the reorganization of numerous state and local agencies to form a separate environmental entity; the Clean Air Act of 1970; the 1972 amendments to the Federal Water Pollution Control Act; and a broad range of state and local legislation, from tougher standards and controls to greater appropriations for environmental activities. For these policies to be effective, environmental management has to integrate knowledge from a variety of fields and disciplines.

The complexity of environmental issues and trade-offs involved in achieving environmental quality necessitate an understanding of the various perspectives on the environment held by government, industry, business, citizens, economists and ecologists. Strategies for environmental management--such as techniques for citizen participation, management information systems, organizational structures, special regulatory procedures and controls, legal action, etc.--are in the process of being developed and tested as tools for the environmental manager. Furthermore, authorities and responsibilities of the different levels of government must be defined. Cooperation among governmental levels, industry, and citizens is essential for success in meeting the environmental challenge. For these reasons, the National Conference on Managing the Environment was conceived to address these problems and to open a dialogue between managers--public and private--on the environment and related issues.

The National Conference on Managing the Environment was held on May 14 and 15, 1973, in Washington, D. C. Approximately 350 persons, predominantly public officials of all levels of government, attended the discussions of various aspects of environmental management. The conference sessions covered the following topics: the environment--how comprehensive; interaction at the local level; a decision maker faces the environment; local government experience; regional government experience; legal and judicial constraints; public involvement; environmental technology; growth; standards; comprehensive planning; intergovernmental relations; and four technical workshops. The conference

was sponsored by the Environmental Studies Division, Washington Environmental Research Center, U.S. Environmental Protection Agency. The conference was prepared under the direction of Dr. Peter House, Director, Environmental Studies Division, and Mr. Alan Neuschatz, Chief of the Division's Environmental Management Research Branch. The conference was administered for International City Management Association by Claire Rubin, Director of ICMA's Contract Research Center, and Steve Carter, Assistant Director, Contract Research Center. The conference arrangements and compilation of this report were coordinated by Joan Werner, ICMA Research Associate.

The texts for the chapters were written by the following: Chapter I (Introduction) -- Peter Nobert, Administrative Assistant for County Supervisor, Fairfax County, Virginia; Chapter II (The Environment as a Policy Issue) -- Mary Ann Allard and Lyle Sumek; Chapter III (Organizing for Environmental Management) -- Steven Carter; Chapter IV (Citizen Participation in Environmental Management) -- Joan Werner; Chapter V (Strategies for Managing the Environment) -- Lyle J. Sumek, Professor of Public Administration, University of Colorado; Chapter VI (Environmental Management Information Systems) -- Stanley Wolfson, Director, Urban Data Service Center; and Chapter VII Intergovernmental Relations) -- Project Staff.

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A word of gratitude is also due to all of the speakers at the National Conference on Managing the Environment, whose speeches and papers formed the backbone of this report.

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CHAPTER I: INTRODUCTION

Over 350 governmental decision makers and private citizens convened in Washington, D.C., May 14-15, 1973, for the National Conference on Managing the Environment sponsored by EPA and administered by ICMA. Robert Fri, Acting Administrator of EPA, headed a list of nearly sixty authorities on environmental management. Discussion topics ranged from environmental decision making to specific environmental programs, such as growth control.

In providing an overview of environmental management, Mr. Fri said that:

> in the brilliant burst of environmental awareness of the past few years, we have devoured most of the knowledge painstakingly built up over decades. We set six ambient air standards all at once. Now we will set no new ones for sometime, because we don't know how. We consumed, in one act, years of research... But now we ought to invest in new capital -- new ideas, new discoveries, new techniques -- for the long struggle that lies ahead.

Mr. Fri explained that an ecologically well-managed society will "require new sophistication of state and local officials, new means of reaching political decisions that encourage input by the average citizen, certain restraints on consumer habits and preferences, and above all a new set of values." For this sensitive intergovernmental balance to be successful, he noted that:

> a necessary retooling would focus upon land use, transportation controls, energy planning, and an assessment of technology itself....As we learn to design with nature, we shall create a higher form of civilization that is not only productive and efficient, but more orderly, humane, and beautiful as well.

A critical aspect of environmental management is the issue of citizen involvement. Russell Train, Chairman of the Council on Environmental Quality (CEQ), called for active public participation in government decisions on environmental matters. He said, "...that management must have two key elements; first, the best information and feedback for decision making; and second, follow-up of decisions and tasks."

With the aid of an active, informed citizenry, Mr. Train commented that the administrator may be more accountable and responsive to citizens, and better equipped to cope with environmental problems. He said, "The public can provide an essential source of information -- in providing an early warning system of the existence of problems, and then in holding bureaucratic feet to the fire to see to it that regulatory programs are implemented." Mr. Train stressed that the right of citizens to have an input into environmental decision making is ensured through federal legislation, including the environmental impact statement process. In his view, "Only through such participation can we achieve that sense of mutual trust and shared purpose that will provide the essential strength not only for our environmental programs but for our society as a whole."

A commonly identified cause of our environmental problems is the over use of technology. In taking exception to this, Buckminster Fuller, inventor who developed the geodesic dome, said that in his view, more, not less, technology is needed to overcome environmental ills. He concluded, "It's an ignorance crisis we face, not a pollution crisis, or an energy crisis... But, above all, I think nature is really trying to make a success of man despite his ignorance."

A critical issue addressed at the Conference was the ability of government to adopt effective environmental policies and programs. In a series of "Reflections" written during the conference, Kenneth Boulding, economist, University of Colorado, commented on the governmental response to ecological problems when he noted:

> The quiet revolution of the planning of the land,
> At the state and local level may be very well in hand
> But one may have nagging doubts on whether guiding growth in quality,
> Is much within the power of any level of the polity.

Senator Hiram L. Fong (R-Hawaii), the ranking minority member on the Senate Appropriations Subcommittee handling environmental protection, said that we must pay more attention to the costs of cleaning up the environment. He stated that:

> One of our first goals must be to define more precisely what we mean by cleaning up and improving our environment.... We need to devise scales of values -- scales of values that will show the cost in dollars, the cost in resources, such as fuel oil, power output, and energy input; and arrange these on a graph that will show all the costs in relation to each degree of quality of air or each degree of quality of water or whatever the environmental factors involved are....We need to develop benefit-cost ratios for environmental projects.

During the conference, numerous workshops were held on specific strategies that would aid in identifying and analyzing successful approaches to environmental management. These workshops had three focal points. The first dealt with governmental organization for environmental management, concentrating on experiences, local and regional government organizations, citizen involvement, and intergovernmental relations. A second concern focused on the gathering and assembling of information and technology for use in environmental management. The workshops addressed the general topic of environmental technology, with specific technical sessions on the Arizona Trade-Off Model, the General Environmental Model, Integrated Regional Environmental Management Project, and the Strategic Environmental

Assessment System. Finally, the workshop examined strategies used by government in managing the environment, including growth controls, legal actions, environmental quality standards, and comprehensive planning.

In conjunction with the Conference, an Anthology of articles was published to provide an introduction to environmental management. Among the subjects covered were: characteristics, cures, and costs of environmental problems; perspectives of local officials, businessmen, and environmentalists; citizen participation; land use planning; environmental impact statements; and economic incentives and penalties.

The purpose of this Report is to summarize the highlights of the Conference and to analyze innovations in environmental management. Each chapter addresses a major aspect of environmental management coordinating an original integrative article and selected papers presented during the Conference. Chapter two analyzes the complexity of the environment as a policy issue. The third chapter presents differing organizational approaches for managing the environment and analyzes the changing organization patterns at the state, regional and local levels. Chapter four discusses citizen participation, including the strengths and weaknesses of public hearings, advisory boards, citizen-initiated legal suits, and public education. Chapter five provides a framework for an analysis of different strategies used in environmental management. The analysis concentrates on the adoption of environmental policy statements, (i.e., general environmental policy and limited growth), and specific environmental actions, (i.e., comprehensive planning, environmental impact statements, environmental quality standards, economic incentives and penalties, and land use controls). The sixth chapter analyzes management information systems for the environmentalist. Specific decision making models are summarized and evaluated. The Report concludes with chapter seven probing the complexity of intergovernmental relations and the impact that "New Federalism" has on environmental programs.

BEYOND THE BRUSHFIRES

Robert W. Fri*

The people of this country will be called upon to make many difficult environmental decisions during the 1970s. Their choices must be wise, for they will determine not only the quality of their own lives, but the prospects of civilization for generations to come.

The choices will be difficult, for problems are are not transient phenomena to be wished away. It takes only the fuel shortages we have already had for us to realize that the earth's ability to supply us with the clean air and water, with fertile land, with minerals, fuels and wilderness--that this capacity is finite. We cannot create new air, land or water, so we must husband these resources. Surprisingly, we are just now relearning the husbandry our forebears knew so well.

But can we manage our environment wisely? To be sure, we have set the stage for control of the more obvious kinds of air and water pollution, but we have only begun to consider the subtler interactions between man and his environment. We are only now beginning to understand the complex web of forces that determines the quality of our life-forces such as land and energy use, transportation economic growth, urbanization, population, and the advancing juggernaut of technology.

Because we do not understand these forces, we still act as though every environmental issue was independent of its brothers. We struggle with each problem as though it were the first, and make each policy choice as though it were the last. Then another crisis grabs our attention, and we start the process all over again.

But it could be different. We could think ahead. For example, two decades ago, the nation's love affair with the automobile was entering its most lyrical phase. On the assumption that every American had a fundamental right to go anywhere at any time by car, we designed a national transportation system based largely on highways.

We now have the best highway network in the world and some of the best traffic jams, best pollution, best ugliness, best noise and a very advanced case of urban decay.

*Presented by Robert W. Fri, Acting Administrator, U.S. Environmental Protection Agency at the National Conference on Managing the Environment.

Yet it would have been a fairly simple matter to have measured the pollutant output of the average automobile, analyzed a few airsheds, projected highway usage, factored in population growth and devised a reasonably accurate forecast of air pollution in 1970. All that could have been accomplished using data and techniques available in the early 50's.

Thus, with a little foresight, we would not have had to deal with the emissions problem on an emergency basis. Much of the damage to health, property and vegetation in the interim might have been avoided, if we had only thought more systematically about the problem.

Managing the environment as a system is complicated. However, it is no secret to the well-informed that we have the information to develop a systems solution to a great many of our ecological problems now. We do not need any fabulous breakthroughs or quantum leaps to at least get started on the design of an environmentally integrated society.

It is simply common sense, cheaper, and more effective to solve problems in tandem and to plan ahead.

The situation in San Diego is instructive. In 1971 some 158,000 tons of volatile organic compounds were being dumped into the county airbasin from all sources. Auto emission and stack gas controls were clearly not enough to meet federal standards. So the county promulgated rules to stop the evaporation of hydrocarbons throughout the gasoline transport network -- loading of storage terminals, filling of trucks, transfer to service station tanks and even filling up the customer's car.

The technology for capture and recycling of vapor from large storage tanks was already known. The challenge was to create a closed loop system embracing all four fuel transfer points.

San Diego, therefore, decreed that all gas handling vehicles or facilities with tanks of more than 550 gallon capacity must use special nozzles to prevent escape of any vapors whatever. At the service end a low vacuum system draws the vapor back into the station's own tank or into the truck itself, and the excess can be transported back to the tank farms for condensation and re-marketing.

It sounds clumsy, but such an arrangement will pay for itself within seven or eight years, which is about the same time it takes to amortize the cost of a service station. In a time of fuel shortages and rising prices for gasoline, the projected 90% recovery rate for evaporated gasoline should commend itself to all of us. The typical big commercial station -- to which the rules apply -- will save $200 per year in recycled gasoline and San Diego county as a whole will save 6.15 million gallons of gas per annum.

This is one of that increasing number of cases in which a system approach to pollution control pays off for everybody: the community, the businessman, the national energy planner and even the customer. It is cheaper, faster and less prodigal with resources.

But there are dangers. Too often, the magic word "system" hides our ignorance. Worse, we fall into the trap of thinking our work is done when we discover a theoretical or engineering "solution" to our problems. Systems thinking and long-range planning are not the whole answer to anything.

The more difficult question is: "who is going to apply all this sophisticated knowledge?" In solving environmental problems, the burden will fall, as it often does now, on the shoulders of state and local governments. Systems thinking does not change the reality that these levels of government remain closest to the problems, and are most able to determine what should be done and what is possible.

First, to be effective in the struggle against pollution in all its protean forms, local governments must develop a new expertise unlike anything we've seen before. The first step involves the development of the professional capacity to handle such tools as operations analysis, longrange multifactor forecasting, airshed models, land planning, traffic simulations and the like. More difficult will be learning how to apply this capacity to the day-to-day grind of running government. State and local officials should test out the scientific techniques we in EPA are testing and let us know what works and what does not.

The next demand on local governments will be to forge new alliances among themselves and with water districts, air pollution control commissions, zoning boards, and planning groups. We must end the fragmentation of local responsibility for managing the environment, for the environment routinely overlaps ancient and arbitrary jurisdictional lines. It makes no sense, for example, to exclude San Bernardino from the Los Angeles air pollution control district when the prevailing winds blow east.

Indeed, perhaps the most difficult political task local government will face in the next ten years will be to bring many separate authorities to bear in a coordinated way on problems that do not and cannot yield to piecemeal solutions, no matter how much we yearn for bygone days of more or less complete autonomy.

It is particularly important to examine critically the great American shibboleth known as growth. It is our own special sacred cow, and in its most exaggerated form it makes environmental management difficult if not impossible. It is the antithesis of stability.

An ecologically well-managed society will be quite different from the one we are familiar with. It will require new sophistication of State and local officials, new means of reaching political decisions that encourage input by the average citizen, certain restraints on consumer habits and preferences and, above all, a new set of values.

We may have to make do--indeed, we must learn to want to make do--with smaller cars, with less energy, with recycling our wastes instead of throwing them in the city dump, and adjusting the size of our families to responsible norms. We will have to stop treating the good earth as a mine to exploit and start treating it as a single, fast-shrinking neighborhood where every man labors for the good of all.

Years ago, they would have said we've been eating our seed corn. For in the brilliant burst of environmental awareness of the past few years, we have devoured most of the knowledge painstakingly built up over decades. We set six ambient air standards all at once. Now we will set no new ones for some time, because we don't know how. We consumed in one act years of research.

For let there be no mistake about it--getting control of air and water pollution will be simple compared to solving the higher problems of an advanced technological society. We must go beyond enforcement, important as that is, and focus more sharply on land use, transportation controls, energy planning and an assessment of technology itself.

Nor is it a task for lawyers or scientists or public servants acting alone; it demands cooperation, breadth of mind and openness to change. The greening of America will be largely up to the creative leadership of public health and pollution control departments, mayors, council members, regional planners and county officials, working with citizen groups to devise action plans for the integrated environs of tomorrow.

The society of the future will be more orderly and efficient than the one we have known. We will enjoy longer lives and better health. We will waste fewer resources. We will not be so obsessed by quantity in lieu of quality.

I believe we will realize once again our true dependence on the biological world. Environmental attitudes will be built-in, so to speak, not a topic for debate or study but a way of life. As we learn to design with nature we shall create a higher form of civilization that is not only productive and efficient, but more orderly, humane and beautiful as well.

Then man will truly be the steward of the earth, and a wise guardian of unborn generations.

MANAGEMENT FOR THE FUTURE

Russell E. Train*

Three years ago when the National Environmental Policy Act was first enacted, I called it a "new experiment in government." It certainly constitutes one of the most significant legislative reforms in many years.

While the ultimate success of that experiment cannot yet be measured, it has already demonstrated extraordinary success and is generating basic reforms in the way our government does business. Of particular significance is the fact that these reforms have enlisted the energies not only of Federal agencies, but also of the Congress, the Courts, State and local governments, industry and, most important of all, private citizens and organizations all across the country. The truly extraordinary dimensions of this involvement provides a societal breadth to environmental decision making which is completely unprecedented and which provides its greatest promise for the future.

It has only been a few short years since environmental concern first gripped the public attention. As Government began to respond to the growing public demand for action, we found the institutional base for environmental management either badly fragmented or even in some critical areas nonexistent. Thus, the first urgent need was to create an effective organizational framework for both policy-making and administration and to provide the basic statutory authorities for standard setting and regulation. On both these fronts, we have made remarkably strong progress over a short period of time. CEQ and EPA have been brought into existence. While I might be accused of self-serving if I said that CEQ has achieved notable success in strengthening environmental policies both domestically and internationally, I feel under no such constraint in saying that EPA has become a strong and effective force for environmental protection. EPA's record, in its little more than two and one-half years life, is one in which all of its personnel can take great pride. Beyond these organizational changes, strong new water quality legislation, the Clean Air Act, new pesticides legislation, and laws to regulate noise and ocean dumping are now on the books. These represent major successes. There, of course, remain a number of important items for legislative action recommended by the President on which we still need Congressional action. Strip mining regulation, national land use policy, toxic substances control -- these are among the high priority items on which we will continue to press the Congress for early approval.

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*Presented by Honorable Russell E. Train, Chairman, Council on Environmental Quality, at the National Conference on Managing the Environment.

At the same time, I think it fair to say that increasing emphasis must now be given to effective implementation of existing programs under sound environmental management principles. Thus, today's conference is particularly timely, and I congratulate EPA and ICMA for their initiative in organizing this excellent program.

Your agenda is very comprehensive and in my own brief remarks I will not attempt a complete prescription for environmental management but will emphasize a few significant points.

It seems to me that management must have two key elements: -- first, the best information and feedback for decision making; -- second, follow-up of decisions and tasks. Today I wish to talk particularly about two information inputs to environmental decision making and management. The first of these is monitoring, to which I would also add improving our research data base. The second is citizen participation.

Accurate and timely information on the status of the environment is necessary to shape sound public policy and to implement environmental quality programs efficiently. It is virtually impossible to develop effective programs and to monitor their implementation without good monitoring data. Very detailed data are necessary for certain types of planning and enforcement. For top management and general public policy development, monitoring data must be shaped into easy-to-understand indices that aggregate data into understandable forms. I am convinced that much more effort must be placed on the development of better monitoring systems and indices than we have in the past. Failure to do so will result in sub-optimum achievement of goals at much greater expense. The critical relationship of good monitoring data to state implementation plans under the Clean Air Act is obvious. Our increasing recognition of the impact of non-point sources of pollution on water quality is largely based on the recent development of new monitoring data. Effective strategies for dealing with this problem can only be developed in conjunction with continued improvement in this data base. These are a few of many possible examples.

The need for constantly improving our research base, both for the identification of environmental problems and for the development of appropriate environmental standards, becomes greater all the time. The effects of pollutants on human health and other values must be determined as accurately as possible and the economic and social impacts of alternative regulatory systems analyzed in order to help provide a basis for the most effective control strategies. And, of course, the need for research extends across the entire environmental field -- not just to the management of pollution control programs. Thus, for example, the complex impact on natural systems of water resource projects such as stream channelization should be determined by adequate research and the resulting data should be built into the decision making process. I emphasize "built into the decision making process" because there are vast amounts of research data available that are too seldom utilized. Likewise, as we develop our monitoring systems, these too must extend beyond pollutants to fish and wildlife, forests and vegetation generally, wetlands, soils, etc. My strong impression is that we are not doing an adequate job of monitoring in these areas.

Turning now to citizen participation, I will state my absolute conviction that this is the single most important ingredient in the environmental management process.

The environment is just too important to be left to us bureaucrats.

We have been making progress in improving citizen participation -- largely under the prodding of the National Environmental Policy Act -- but we need to do far more. Government at all levels must dramatically change its attitudes about public participation in environmental decision making before we can have truly effective management systems. We must really level with the public. It is an unfortunate fact that many consider public hearings and public hearings and public disclosure of environmental impact analyses as simply delaying orderly management. This view is absolutely unacceptable.

Public participation provides critical inputs from those who actually live in the particular environment at issue. The public can provide an essential source of information -- in providing an early warning system of the existence of problems, in developing realistic solutions to those problems, and then in holding bureaucratic feet to the fire to see to it that regulatory programs are implemented. Recently, I heard the point made that when the supertanker terminal was under consideration at Machiasport, Maine, the most influential element finally was the negative opinion of the local lobster fishermen whose intimate knowledge of tides, currents, fog, and hidden rocks convinced them that the proposal involved unacceptable risks.

In our increasingly complex technocratic society, there is a strong tendency to leave the problems to the experts. This is a tendency that should be strenuously resisted. We need technical expertise but, left unchecked, expertise alone, not moderated by a broader scale of values, will often fall far short in solving complex problems and may even create new problems in the process. Likewise, government management must not be merely the province of the technocrats. We in the government are just not that smart -- or wise. Only by laying out the alternatives for public comment can we get a full range of alternatives as well as some consensus among those governed. Thus, public participation in decisions must be an integral part of good public management, and particularly of environmental management. Only through active citizen involvement can we set goals that have the consent of the public. Only through public participation can we have a truly effective control and feedback program. Thus, for example, in promoting new technologies and in making choices between alternative technologies, an essential element of the assessment process must be a determination of the relationship between particular technological goals and human values. Such a determination cannot be made in splendid bureaucratic isolation but only as part of a process which opens itself to the full interplay of ideas and values within our society. And, of course, the need for such openness and interaction extends across the full range of government decision making and to all levels of leadership.

Related to this problem is the fact that all too often resource managers begin to believe that they are engaged in managing their own resources -- their own forests, their own river basins, their own fish and wildlife and rangeland, forgetting that we are acting as custodians of these resources for all the people. We cannot exercise such a trust responsibly or effectively unless we conscientiously bend every effort to encourage public participation in decisions affecting the future of these resources. Again, this need for a sense of public trust on the part of administrators extends across the board. Administrative arrogance is almost a certain guarantee of failure of public understanding, loss of public support, and ultimately of wrong decisions.

In the environmental impact analysis process, we have a magnificent new managerial tool that can help serve the objectives I have described. It is admittedly an uncomfortable process for the bureaucrat. No program official enjoys making an objective analysis of the impacts of his proposed project, or admitting that there may be alternative courses of action, or making his proposal available for public comment by other agencies, by State and local governments, or by the public.

That the 102 process has stopped some projects and delayed others is plain but this alone is not reason for criticism. Most likely the projects should have been stopped or should have been delayed. The fact is that the environmental impact analysis process is a major step forward in providing more comprehensive, systematic, interdisciplinary and sophisticated decision making. Most of the significant problems which our society must deal with today are inherently complex. They defy traditional management approaches, organizational boundaries, and bureaucratic compartments. Thus, the highway planned by the Department of Transportation affects the mass transit goals of the same agency, impacts on fish and wildlife habitats of concern to the Department of the Interior, gives rise to air and water pollution and noise problems of concern to EPA, and may set in motion forces affecting patterns of economic and population growth which are of concern to our entire political structure. The environmental impact analysis process provides an integrative force in decision making which seeks to avoid bureaucratic tunnel vision and to require comprehensive consideration of all relevant concerns. Of paramount importance to this process is the requirement for public disclosure and the opportunity for public comments.

There is no question in my mind that the NEPA process provides one of the most significant administrative reforms in the history of our government. Its continued vitality is essential to sound environmental management. It is incumbent upon all of us to see to it that in every agency the NEPA process has the necessary staffing, funding, and top-level support to make it truly effective.

Throughout these remarks I have stressed the importance of public participation to good environmental management. There is another reason for encouraging such participation on which I would like to touch briefly. As our technocratic society becomes increasingly overwhelming in both size and complexity, the average citizen feels further and further removed from the reality of decision making. He feels incapable of influencing the forces at work around him and events take on an air of seeming inevitability. This is a tendency against which we must fight because it can only lead to alienation from and cynicism with the essential workings not only of government but of society as a whole. Environmental programs provide a magnificent opportunity to give private citizens a new sense of responsible participation in the social process.

Finally, as we seek to improve management techniques for environmental quality, it is essential to remember that technique alone cannot secure environmental goals. Systems analysis, managerial skill, and technical expertise can help define problems, present alternatives, and identify costs and benefits. However, to be truly effective as part of a positive and creative process, analysis must proceed within the context of positive purpose. Analysis alone can become a largely negative force, better adapted to defining what not to do rather than what to do. With the increasing complexity of the problems of the environment as well as of our society generally, we need urgently to improve our analytical skills and capability. But with this there must be a sense of purpose, of goals, and of values. To provide this value framework within which managerial skills can be exercised is the true role of leadership. Without it, all of the managerial competence in the world can produce only sterility. Cost benefit analysis can illuminate choices but it cannot give direction. Thus, above all else, effective management for a high quality environment requires policy commitment at all leadership levels.

Let me close by once again emphasizing that direction and purpose in our public affairs can best be achieved in an open process that fully engages the participation of the public. Only through such participation can we achieve that sense of mutual trust and of shared purpose that will provide the essential strength not only for our environmental programs but for our society as a whole.

CHAPTER II: THE ENVIRONMENT AS A POLICY ISSUE

Environmental quality is one of the most critical issues currently facing the United States. In focusing on this issue, the intention of the Conference was not to document the numerous environmental crises or to trace the evolution of the environment as a policy problem. Rather, several sessions were aimed at highlighting dimensions of the environment in the hope that better understanding will improve programs for environmental management.

Senator Hiram Fong (R-Hawaii) remarked during the Conference,

> Managing our environment runs the whole gamut of land use, water resources, conservation, air pollution abatement, energy conservation, the beauties and bounties of nature. It requires a wide spectrum of disciplines in science and technology, in law, in administration, in legislation. And above all, it requires citizen participation and citizen support.

Thus, the study of environmental problems and the complex relationship between man and his environment must integrate the knowledge and theories from a variety of disciplines including biology, chemistry and physics from the physical sciences, and economics, anthropology and sociology from the social sciences. Although scholars in the disciplines involved in environmental matters should work together in formulating solutions and integrating knowledge on environmental problems, this has not always been the case. By bringing together speakers from diverse backgrounds, the Conference sessions attempted to probe the various dimensions of the environment.

The purpose of this chapter is to integrate the views and ideas expressed by participants at the Conference. First, the concept of the ecosystem is defined and its more controversial characteristics discussed. The next section focuses on the issue of environmental quality as it relates to economics and economic growth. The discussion reflects the interrelationships between environmental policies and economic, scientific, defense, and domestic policies. The third section examines environmental problems and their potential solutions from the perspectives of decision makers -- both government officials and corporate executives. Finally, the chapter concludes with a discussion of environmental decision making in the context of rational and incremental decision making.

THE ECOSYSTEM: A PRIMARY CONCEPT

The basis for developing more effective public policies and programs for solving environmental problems may lie in our ability to develop a unifying concept to coordinate the factors related to environmental quality. One such concept is that of the ecosystem or ecological system. While it was developed primarily in the biological sciences to represent the relationship between organisms in a specified community, the ecosystem has been broadened to include social factors as well.*

The ability of an environmental manager to be effective may depend on his knowledge of the intricate workings of the ecosystem. In searching for a simple definition of ecosystem, we can refer to a biologist who was one of the first to use this concept: Eugene Odum, presently director of the Institute of Ecology at the University of Georgia and former president of the Ecological Society of America. He defines the ecosystem as a unit of biological organization made up of all of the organisms in a given area (community) interacting with the physical environment, so that a flow of energy leads to characteristic trophic structure and materical cycles within the system.+ In this definition, the problem of technological development may not be adequately treated.

In an effort to be more inclusive, during his presentation, Kenneth Boulding, Professor of Economics, University of Colorado, presented a broader definition based on his work in economics and systems theory. He defined the ecosystem as:

> a system of interacting species, a species being any set of elements, each of which conforms to a common definition, the total number of which is a population which can be added to by the formation of new elements (births or production) and can be subtracted from by the disappearance of old elements (death or consumption).

Dr. Boulding argued that the products of man's technological development, which he labelled artifacts, must be regarded as an integral part of the ecosystem. For example, the automobile is as much a species as the horse. It has an input of materials from mines and an output of materials into a dump, and it is nourished by gasoline and excretes carbon dioxide, carbon monoxide, and nitrous oxide. Although man has produced many changes in the ecosystem, the accumulation of many technological developments, like the automobile, has the potential for creating even greater and more rapid changes in the ecosystem.

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*See Eugene Odum, Ecology. New York: Holt, Rinehart and Winston, 1963.

+Eugene P. Odum, "The Strategy of Ecosystem Development," Science CLXIV (18 April 1969), p. 262.

It is important to remember that survival of the ecosystems depends on a cycle of materials and a source of energy. For example, the increased use of household appliances and new food products, both designed to simplify domestic activities, have had drastic effects on the cycling of materials and energy consumption, thus threatening the future existence of some ecosystems. In defining components of the ecosystem, therefore, technological developments should be included.

Moreover, man has a tendency to use these technological developments in ways that disrupt the normal functioning of the ecosystem. Ecosystems vary in their tolerance to change and effects of single pollutants. There are certain ecosystems where sources of air pollution should not be concentrated. However, certain physiographic regions attract uses to which they are intolerant. For example, regions which exacerbate pollution, such as a stagnant air valley, may be the location for sources of toxic emissions. Another example is the estuary marsh ecosystem which may be used for ports and refineries for which they are unfit. The concept of "fitness" therefore becomes critical in applying the concept of the ecosystem to environmental planning and management.

To achieve environmental "fitness," Eugene Odum has postulated a model of ecological succession.* Ecological succession involves the development of ecosystems, paralleling the developments of biological organisms and human society. It may be defined by three parameters:

> (i) It is an orderly process of community development that is reasonably directional and, therefore, predictable. (ii) It results from modification of the physical environment by the community; that is, succession is community-controlled even though the physical environment determines the pattern, the rate of change, and often sets limits about how far developments can go. (iii) It culminates in a stabilized ecosystem in which maximum biomass (or high information content) and symbiotic function between organisms are maintained per unit of energy flow.+

The strategy of succession is to increase control of the physical environment by achieving maximum protection from perturbation. It is important for the environmental manager to recognize that a strategy of maximum protection in trying to achieve maximum support of complex biomass structures often conflicts with man's desire of maximum production. To help in environmental planning, Dr. Odum argued that more emphasis be placed on compartmentalizing the environment in order

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* _Ibid_, pp. 262-270.

+ _Ibid_, pp. 262.

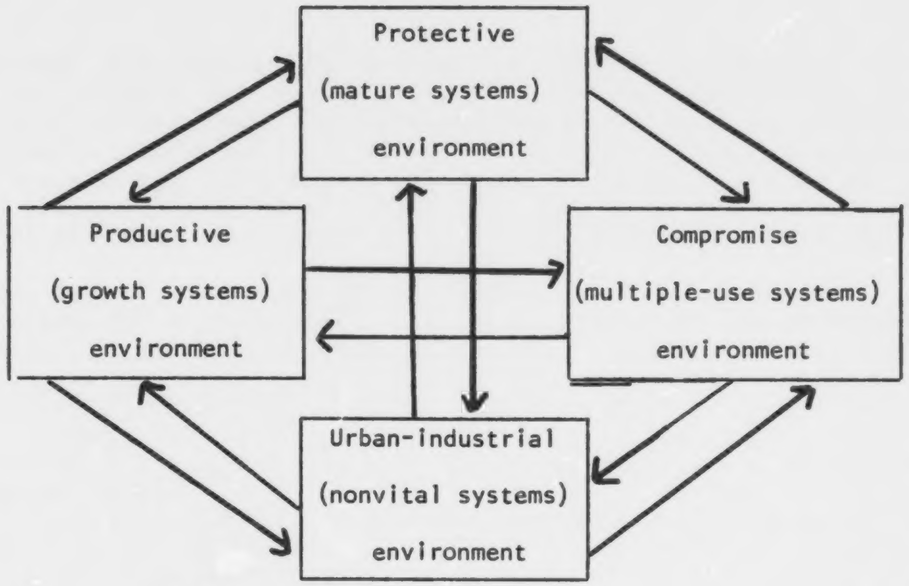
Protective
(mature systems)
environment
Productive
(growth systems)
environment
Compromise
(multiple-use systems)
environment
Urban-industrial
(nonvital systems)
environment

FIGURE 1: COMPARTMENTAL MODEL OF ECOSYSTEMS*

that growth type, steady state type and intermediate type ecosystems may be linked with urban and industrial areas for mutual benefit. He presented a compartmental model (Figure 1) in which the basic kinds of environments required by man are classified according to biotic function: (1) productive environments characterized by growing ecosystems, (2) protective environments which are mature ecosystems, (3) compromise environments which are multiple use ecosystems, and (4) urban-industrial environments which are nonvital ecosystems. According to Odum, it would be possible, by using computer simulations, to determine the limits that might be imposed on each component ecosystem in order to maintain regional and global balances in the exchange of vital energy and materials. The information could be used by environmental planners, environmental managers, legislators and administrators in determining how much land should be used for high yield agricultural purposes and for urban sprawl -- two potentially destructive land uses. In conclusion, he argued that:

> A balance between youth and maturity in the socio-environmental system is, therefore, the really basic goal that must be achieved if man as a species is to successfully pass through the present rapid growth stage, to which his is clearly well adapted, to the ultimate equilibrium-density stage, of which

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*Ibid, p. 269.

> he as yet shows little understanding and to
> which he now shows little tendency to adapt.*

Whether equilibrium exists in the ecosystem, as presented by Dr. Odum, is undergoing serious debate and analysis. During the session "Environment: How Comprehensive?," Ian McHarg, Urban Planner and Professor, University of Pennsylvania, pointed out that the ecosystem is in a dynamic balance where the equilibrium point is in a state of flux. In taking exception to this, Dr. Boulding stated that equilibrium in a literal sense is virtually unknown in the real world. Only approximations of equilibrium really exist, since it is difficult to conceptualize a disequilibrium process. In the Anthology, C.S. Holling and M.A. Goldberg provide another perspective. They argue that since the ecological system is not in a delicate state of balance, but rather in the process of developing, the key feature of the system is resilience.+ The internal resilience is the ability of the ecosystem to absorb incremental changes. For example, long before man, the ecosystem experienced traumas and shocks imposed by climatic changes and geophysical processes. Ecosystems have been able to absorb and adapt to these situations. Only when massive shocks occur or incremental changes accumulate is the resilience exceeded, thus generating dramatic and unexpected signals of change.

ENVIRONMENTAL QUALITY AND ECONOMICS

From the discussion of ecosystems, it is evident that successful functioning of the ecosystems depends to a large degree on the total social system and related policy. For example, United States science policies, which involve the direction of scientific research and the allocation of funds for research and development, play a large role in determining the types of technology available for production and consumption. The efficiency of these technologies and their use of natural resources will affect environmental quality. Other policy areas with environmental consequences include transportation, housing, urban development, health, agriculture, and economics. One of the issues focused on at the Conference was economics and its relation to environmental quality.

The economic system is a subsystem of the total social system. Its major function is to govern the artifacts, skills and services which are exchanged in a society. Economic growth is the major goal in a capitalist economy. In attempting to achieve such growth, the economic system regulates the use of natural resources in the ecosystem and the disposal of waste into the ecosystem. The build up of residuals -- leftovers of production and consumption activities -- has become a major environmental problem. The resilience of many ecosystems is being tested by this accumulation of residuals. As a result, our society may no longer be characterized as the "affluent" society but rather as the "effluent" society.

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*Ibid, p. 269

+C.S. Holling and M.A. Goldberg, "The Nature and Behavior of Ecological Systems," An Anthology of Selected Readings for the Conference on Managing the Environment, I-20.

The quest for survival requires the use of various elements in the ecosystem. As pointed out by Dr. Boulding, virtually all human activity produces both good and bad effects; this is why we have pollution. He continued that:

> ...not because there are wicked people who like to pollute things (this is a very minor element in the problem), but because if we want beef, we have to have polluting feedlots, if we want electric power, we have to have polluting power stations, and so on. A critical problem in the economy is how to make private decisions for private benefit also produce public benefit.

Before the development of sophisticated technologies and the proliferation of consumer demands for goods, natural resources were used without limit and waste was dumped into the environment where it would dissipate. A prevalent belief was that one person alone could not cause environmental damage since air, water and other natural resources were so plentiful. However, our pursuit of economic growth and the accompanying high standards of living, drastically increased the amount of natural resources being used for production and consumption, and the amount of wastes being discharged into the environment. By 1960, many scientists were beginning to identify some negative consequences of massive industrialization, more sophisticated technology, and rapid economic growth. As Professor L.J. Battan stated in The Unclean Sky: A Meteorologist Looks at Air Pollution,*

> The atmosphere is often treated as a garbage pail of infinite size. Obviously, this is a serious mistake. Our layer of air should not be regarded as a dumping ground in any circumstances. The quantity of pollutants that can safely be put into the air depends on the property of the atmosphere at the moment of release and subsequently. In some periods a great deal of smoke can be added with little danger. At other times the condition of contaminants must be kept at an absolute minimum.

Even today, some economic policies support the myth that the environment can be abused without limits. There are several reasons for this.

First, a person is generally not directly affected by the pollution and possible environmental damage he creates. The consequences of his means of production and consumption are felt by his neighbors. For example, before air reaches the outer atmosphere it affects people who are in the direction of the wind. The private costs of pollution are low enough that the individual is willing to accept it. Private costs may also be lower than the costs to the rest of society. During his presentation, Arthur Busch, Regional Administrator, United States Environmental Protection Agency, underscored this point by emphasizing that pollution places the rights of individuals against the public welfare.

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*Louis J. Battan, The Unclean Sky: (Garden City, N. Y. Anchor Books, 1966) pp. 103-104.

A second important factor encouraging damage to the ecosystem is the economic pricing system. Industrial expansion was justified on the grounds that the spillover effects were outweighed by the good that was being produced. Industry used externalities to keep costs down since it was cheaper to pollute than to clean up.

Today, the costs of pollution are extremely hard to define. During his presentation, Joseph Fisher, President of Resources for the Future, pointed out that many causes of pollution are subjective and that damages incurred generally take place years later or miles away from the original source. The central issue is that no market mechanisms exist to register dollar values for environmental deterioration. In analyzing this point further, Marshall Goldman in "Pollution: The Mess Around Us," discussed the pricing of environmental quality.* In the market system, prices affect demands for the product and demands affect prices. When one goes up, the other generally goes down. If the pricing system is to function adequately, the costs of all inputs used in the production processes must be properly identified. Yet how can we identify and price environmental consequences, both the overuse of natural resources and the eventual waste discharge resulting after consumption is completed? What is the dollar value of clean air or dirty water?

A major issue today is who is going to pay for pollution abatement. In the absence of more sophisticated cost procedures, prevention and abatement costs will need to be paid. Mr. Fisher argued that the solution lies in complete subsidization by the government. He noted that we are currently spending one percent of the Gross National Product (approximately $12 billion) on pollution abatement. By doubling or tripling this rate and sustaining the level of funding (thus, $24 billion or $36 billion), he believed that the trend of increasing pollution could be reversed. An opposite view was expressed by Mr. Busch. Since unlimited funding from public sources is unlikely, the producers and consumers will need to bear the costs for environmental improvement. He stated that pollution abatement is one of the costs of doing business. While profits are still necessary, the consequences that have been levied on the environment are no longer acceptable.

A third and final factor which contributes to the deterioration of some ecosystems is our commitment to growth. Historically, our country has been enamoured with growth statistics such as the GNP, new housing starts, or number of cars produced. Rarely have our statistics been able to incorporate esthetic values or the quality of life since few indicators or measures exist. Today, many social scientists have begun to question the concept of growth and posit the idea that our society consider other alternatives such as managed growth or no growth. During his presentation, Ian McHarg described the social-economic policies which could be followed under alternative growth models. If we continue to pursue an uncontrolled growth rate, we would accommodate the maximum social damage at the greatest social cost for the least possible social benefit. A more conscientious policy would be to develop the maximum social benefit at the least social cost and proceed to allocate growth according to gratification of the largest number of people. Critics of managed or no growth stress the following: (a) limited growth may lower material living standards; (b) conservation of materials would take place if substitute materials were found or prices were increased in order to finance social programs; (c) growth is necessary; and (d) an adequate permit system for discharging into the ecosystem can be developed. On the other hand, proponents have argued that a lowering of the material standard of living may result in a higher quality of life since environmental improvements would be made. In the past, growth has not led to the solution of social problems; and the economy has failed to assure or protect the environment. It is not possible to discuss these conflicts in detail here. However, the issue of growth is addressed in the latter part of this chapter, as well as in subsequent chapters.

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*Marshall I. Goldman, "Pollution: The Mess Around Us," An Anthology of Selected Readings for the National Conference on Managing the Environment, p. I-5.

In summary, this discussion focused on the relationship between environmental quality as a policy goal and various aspects of economic policy. The complexity of environmental policy and its interrelationship with our social concerns should be evident. In the Anthology, Blair Bower offered some tempered observations when he concluded:

> Decisions and choices within the environmental sector are linked to decisions and choices in other sectors of the economy. Just as there are limited environmental resources, so there are limited human and capital resources.*

VIEWS AND PERSPECTIVES ON THE ENVIRONMENT

Just as there are many policies that directly affect environmental quality, there are many perceptions of the nature of environmental problems and potential solutions. If environmental managers are going to be effective, they must be aware of these views. The views and perspectives of governmental and corporate officials are presented in this section.

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*Blair T. Bower, "Residuals and Environmental Management," An Anthology of Selected Readings for the National Conference on Managing the Environment, p. I-27.

Government Official

In the Anthology, Charles Henry, City Manager, University City, Missouri, defined the "environment" as referring to "everything around us."* The city administrator in his daily activities must define the concept broadly, due to the complex interrelaredness of problems and programs in the urban environment. During his presentation, John Wentz, City Manager, Phoenix, Arizona, pointed out that managers should for the moment restrict their definition to physical, visual, sensory aspects of the environment. They must resist the temptation to define the environment in terms of life style, a concept of too much complexity for the development of environmental programs. (A further elaboration of Wentz's ideas may be found in the latter part of this chapter.)

Although Mr. Henry defined the environment in broad terms, the city administrator, as guardian of the municipal environment, has limited tools available for improving environmental quality. Primary sources of control are vested in city codes (e.g., building and sanitation codes, private landscaping and sign control). The administrator must be able to secure local code compliance by bringing violations into a local court. Through the courts, everyday occurrences such as litter and sanitation violations can be processed and remedied. On the other hand, Mayor Stephen May, Rochester, New York, saw a wider range of environmental action for local governments. As an urban administrator, he must deliver basic services such as garbage removal, code enforcement, and rodent control. In addition, he is presently faced with the need to retain industries presently located in Rochester, as well as attract new industry to maintain sufficient employment in his community. To accomplish these objectives in environmentally sound ways, Mayor May has been working with industry on some specific issues, particularly the screening of parking lots to reduce visual pollution and a new in-town community to promote balanced development. He believes that those in government must be sensitized to environmental needs and that a balance be struck between the need for jobs and industrial expansion, and the need for a decent environment. While the vigilance over the environment must be continued, the demands for growth must sometimes be accommodated at the same time.

Shelly Mark, Director of the State of Hawaii, Department of Planning and Economic Development, related the steps taken by Hawaii to define and enact a limited growth policy. He discussed the terms "quality growth" as opposed to "quantity growth," which he equated with the concepts of limited growth and increased growth. Dr. Mark pointed out that efforts toward achieving a quality growth pattern must be multidimensional, since a socially desirable balance among economic, social and environmental elements needs to be achieved. To direct any kind of growth policy, several steps were identified: (1) a consensus should be reached on the objectives in planning quality growth, (2) the rates and kinds of growth patterns must be under control, and (3) knowledge must exist in order to predict the effects of certain actions. A further elaboration of Dr. Mark's ideas can be found in the latter part of this chapter.

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*Charles T. Henry, "A Local Government Administrator's View of Environmental Management, " An Anthology of Selected Readings for the National Conference on Managing the Environment, p. II-3.

Corporate Officials

The views of business and industry are important in achieving a comprehensive picture of environmental problems. Many representatives of industry readily point to their own programs for pollution abatement. During his presentation at the Conference, Edwin Nelson of General Motors Corporation identified several essential ingredients for industry to be successful in the pursuit of a better environment: (1) management priorities must be determined, (2) the problems need to be identified, and (3) sound, technically feasible solutions must be developed. He summarized some of the steps taken by General Motors in environmental management. In February, 1971, GM created an environmental activities staff to operate within the corporate structure. Their primary functions are communicating with regulatory agencies, providing technical information to local, state and federal governmental bodies, and establishing environmental control programs that will ensure the best balance between cost and benefit to society. In addition, GM is carrying on large research programs on the environment. One example is the extensive research on alternative power sources to the internal combustion engine. However, since these alternatives will not be viable in the near future, the company is making a concentrated effort to modify and refine present engines and emission control systems, particularly the catalytic converter. Another example of their research activites is in the evaluation of differing processes for removing sulfur dioxide from coal. One of these processes is a regenerative double alkali sulfur dioxide pilot study which would determine if the caustic could be regenerated and used back in the system. If successful, this program would be a significant development in reaching short term solutions to the energy problem.

Although continued research is essential in finding alternatives to controlling pollution, industry may broaden its scope of environmental protection by seeking and creating new markets for environmental improvements. Arthur Busch argued that environmental improvement could become a giant industry, increasing in importance as new technology develops. The possibilities in developing untapped markets for environmental improvements exist within the private sector. In the Anthology, James Brian Quinn outlined how industry and the environment can profit from one another.* One means is to transfer what private enterprise has developed to satisfy consumer demands to developing and filling demands for public consumption and investment such as sewage systems, water supplies, parks and airports. If public markets could be developed by private companies, growth opportunities for industry would occur while many socio-economic problems could be improved.

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*James Brian Quinn, "Next Big Industry: Environmental Improvement," An Anthology of Selected Readings for the National Conference on Managing the Environment, pp. II-9 to II-21.

Mr. Quinn also sees potential markets in properly administered government regulations and standards. An example would be the stringent radioactive emission and waste disposal standards which, if met, would increase confidence in atomic power plants and expand their markets. Eventually proper regulation could elicit new primary markets, contributing to national growth in much the same way as a new product contributes to economic growth. Nevertheless, the shift to a market economy, with heavy emphasis on environmental improvement,will not be without serious costs to individual companies and communities. The problem should be temporary and could be relieved by elongating the impact of change, providing temporary tax relief, or working with communities that have lost industries. Ultimately, the supports would be dropped and the impact of choices would be distributed through industry by means of pricing decisions.

The views presented in this section are not all-inclusive, but rather provide a sample from both government and industry. It is hoped that environmental managers will become familiar with the views and particular circumstances in their own communities.

ENVIRONMENTAL DECISION MAKING

Assuming that an environmental manager has information regarding the environment and is apprised of the views in his community, the decision making process is highly important in relation to improving environmental quality. The environmental manager might consider a variety of approaches to chose from among competing policy alternatives, ranging from an incremental approach to a rational-systematic approach. During his presentation, Charles Lindblom, Professor, Yale University, argued that the only realistic approach is incrementalism. The incremental approach to decision making is characterized by focused attacks on specific problems, thus restricting the number of alternatives and policies to those that differ only incrementally from existing policies. He commented that:

> Since everything is connected, it is beyond our capacity to manipulate everything altogether. Comprehensive plans and broad goals would make a lot more sense if things were not so interconnected. Then, you could factor out a piece of society and deal with it. Since everything is interconnected, the whole social world, or the whole of the environment problem, is way beyond our capacity. We have to find critical points of intervention, tactically defensible, or strategically defensible points of intervention.

Support for the incremental approach in action was provided by John Wentz, City Manager, Phoenix, Arizona, when he suggested that environmental decision making must be realistic. His formula for achieving practical decision making has been in making highly focused attacks such as controlling sporadic development by zoning or cutting down on visual pollution through sign control. Mr. Wentz indicated that short term actions and the winning of small victories make it easier to address more complex and comprehensive problems.

A more rational decision making approach was presented by J. L. McClintock, Weyerhauser Corporation, in his description of the environmental impact of a pulp and paper mill. In order to reduce the B.O.D. (Biochemical Oxygen Demand) discharged from the mills, several alternatives can be developed from which one or two would be selected that result in the least adverse consequences. Through a systematic process, alternatives are examined and evaluated based upon the ability to achieve a viable plan for environmental protection. Then, the decision is made by selecting the best alternative. However, this use of more rational decision making is hampered by the lack of knowledge regarding the ecosystem and the large amount of time consumed in conducting the analysis.

As noted in the Anthology, the environmental manager is faced with a complex political, technical and administrative milieu which makes it difficult to make comprehensive decisions.* This decision may be stimulated or constrained by: ecological considerations, environmental crises, political pressures, unproven management strategies, administrative dilemmas, technical considerations, and governmental requirements. If managers recognize these potential forces and constraints, their ability to deal with the environment in a comprehensive way will be enhanced.

SUMMARY

This chapter has analyzed some of the important points regarding the environment as a policy issue. No claim is made that the ideas mentioned are comprehensive, but rather they reflect the concerns of conference participants. Several major themes emerged from the panels and workshops. First, we do not possess sufficient knowledge on indicators of environmental quality. Second, many of our assumptions regarding growth need to be reevaluated in light of the desire for better environmental quality. Finally, environmental decision makers need to relate environmental problems to other policy areas while developing an environmental management program for specific environmental problems.

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*"Introduction," An Anthology of Selected Readings for the National Conference on Managing the Environment, p. I-i to I-3.

THE ECONOMICS OF ECOLOGY

Kenneth E. Boulding*

It is no accident that the words "ecology" and "economics" both come from the same Greek root meaning "household." They both deal indeed with the housekeeping of the earth, and the economic system can be regarded as a special case of the ecological system of the planet, dealing mainly with the ecology of human artifacts and human behavior.

An ecological system is essentially a system of interacting species, a species being any set of elements, each of which conforms to a common definition, the total number of which is a population which can be added to by the formation of new elements (births or production) and can be subtracted from by the disappearance of old elements (death or consumption). In most populations each element can be identified by its age, that is, the period of time that has elapsed since it was born, and this is frequently an important characteristic of the system though this information is not necessary for the definition of a population or a species.

In biological ecosystems the species and the populations consist of living organisms. The definition of a species is not always clear, although the usual definition is based on reproductive ability, that is, a species consists of elements which can reproduce themselves. Other quantities which are not usually thought of as biological species, however, may be significant, such as the chemical species in the soil, the atmosphere, or the waters, and also variables which are a little hard to put under the general rubric of population, such as temperature, time patterns, annual distribution of rainfall, and so on.

Economic species consist mainly of commodities; for instance, automobiles and their subspecies, such as Chevrolets, Volkswagens, and so on. Social species include human artifacts of all kinds, including human beings themselves, as well as their genetic characteristics, their education, skills, capacities, and so on, which also are human artifacts in a large degree. We should also include social organizations among social species--families, corporations, churches, states, counties, government agencies, voluntary agencies, and so on.

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*Presented by Kenneth E. Boulding, Professor, University of Colorado, at the National Conference on Managing the Environment.

The dynamic process of any ecosystem depends on the relationship between the births and the deaths for any one population, and all other elements of the system, especially the size of all the other populations. If from the state of the system at any one time we can deduce the number of births and deaths in each population in the next period, we know how large all the populations will be at the end of the next period, and hence can go on projecting for successive periods. If births exceed deaths, the population will grow; if deaths exceed births, it will decline; if it declines to the point where the population is zero, it becomes extinct unless it can be re-formed, which is very unlikely. An ecosystem may have an equilibrium position, in which the state of the system is such that the births equal the deaths for all populations.

Equilibrium in a literal sense is virtually unknown in the real world, but there are approximations of equilibrium; for instance, in a climatic ecosystem of a forest or a pond, or a hypothetical stationary state in a society. Because it is difficult to visualize an absolutely continuous disequilibrium process (which is what the world is), it is often useful to think in terms of a succession of equilibrium states, even though this is only approximated in nature. Thus, a mutation is a change in the functions which relate births and deaths to the other states of the system, or it may represent a change in the state of the system through the introduction of a new species. This will almost invariably produce a new potential equilibrium, in which some species may disappear and the new species may either survive or may also disappear. This is the essence indeed of the process of evolution, whether in biological or in social systems. Selection is always the selection of ecosystems, never the selection of species.

A species survives if it has a place or a niche in an ecosystem which survives. The niche of the species is that population, under given conditions in the state of the system, at which the births and deaths are equal so that the population is stable. Ordinarily for populations smaller than this, births will exceed deaths; for populations larger than this, deaths will exceed births, in which case the niche population is a true equilibrium. The niche may be a physical niche, like a cave or a coral reef, or it may not. It may simply be bounded by the pressures of other species.

An important feature of any ecosystem is its system of inputs and outputs. Every biological population requires inputs of food and produces outputs, or excretions. We should include in this the gaseous "foods" and excretions, such as oxygen and carbon dioxide. The inputs and outputs have two aspects--a materials aspect and an energy aspect. A species has to be able to draw more materials from the environment than it excretes if it is to grow. Similarly, every species needs energy if it is to operate and move. If an ecosystem is to survive for very long, it must have a cycle of materials and a source of energy. The nitrogen cycle is a famous example of the first, and, of course, almost all of the biosphere depends on the input of solar energy to prevent its running down.

Man and his artifacts must be regarded as part of the ecosystem, and it makes very little sense to separate the non-human part of the ecosystem from the human part. The automobile is just as much a species as the horse, though its genetics is more complicated. It has an input of materials, mostly from mines; it has an output of materials into dumps; it feeds on gasoline and excretes water, carbon dioxide, carbon monoxide, nitrous oxide and so on; and it survives because it has a niche. That is, there is some population of automobiles in which births equal deaths in any given environment, just like the horse.

There are three basic types of relationships among species: mutual competition, mutual cooperation, and predation. All of these are important. Predation is inherently the more stable of the three.

The evolution of man has produced profound changes in the ecosystem of the world, mainly because the human nervous system has a very much greater capacity for knowledge, that is, for building structures in the internal systems which correspond to the structures in the external system, than any other species. As a result, man is unusually cooperative ecologically with his own artifacts, which can be thought of as a peculiar kind of excretion of human activity. Most living species produce only manure, which is often directly competitive with them, although perhaps indirectly cooperative through its role in the materials cycle. Human beings produce corn, wheat, machines, automobiles, clothing, and so on. These artifacts have resulted in an almost continual expansion of the human niche. There have been times indeed when man has pressed against his existing niche, but this pressure has often resulted in technological improvements, such as agriculture or metallurgy, which have expanded the niche and enabled continuing growth of the human population.

The economic system is a subset of the total social system, and therefore of the total ecological system, which deals particularly with those human artifacts, skills, and services which are exchanged or which are potentially exchangeable. Every person, family or organization of the social system lives in an exchange environment. Each such unit specializes in the production of a limited set of artifacts or services. (Services are simply artifacts--songs, communications, orders, and so on--which have a very short length of life.) He may exchange these directly for other artifacts and services through barter, but as social organization develops some artifact (cattle, metal, cigarettes) becomes generally acceptable in exchange and begins to play the role of money. Money is a general medium of exchange which is accepted not for its own sake but because somebody else will accept it in return for other things. Eventually money becomes divorced from its commodity base altogether and becomes a simple abstract unit of account, like the bank deposit. Even in this form, it still represents a "population"; dollars are born and die, migrate in and out of particular regions just like any other population. If I am adding to my money stock faster than I am spending it or diminishing it, it will grow.

In a developed society barter is a miniscule part of the total volume of exchanges. Most people or economic units have an input of money which they derive from either the sale of some goods or services that they have produced--the wheat of the wheat farmer, or the services of the wage worker--or from "grants," that is, one-way transfers in the form of gifts, tribute, or taxes. They spend out of their money stock for all the various goods and services that they want and can afford. Thus, every social organization has a throughput of money which is not wholly unlike the throughput of nitrogen in the biological nitrogen cycle, and because of this we are able to organize an enormous variety of organizations and artifacts.

Every organization or sector is significantly affected by its "terms of trade," that is, the ratio of the real goods and services it takes in to the goods and services that it gives out, so that our terms of trade "improve" if we can take in more per unit of what we give out. The structure of terms of trade depends on the total relative price structure. Thus, if the price of wheat rises while that of other things does not, the terms of trade of the wheat farmer improve; he can get more other things per bushel of wheat.

The economic system has had a very substantial impact on the total ecological system of the planet, mainly because humans act to increase those populations in the total environment which they perceive as cooperative with them and act to diminish those which they perceive as competitive. This introduces a very significant selective factor in the whole ecosystem, producing grain and potatoes instead of bramble bushes, cows instead of buffalo, automobiles instead of horses, buildings instead of open fields, and so on.

Because the human race has found no really satisfactory social mechanism for population control up to date (except in a few cases in simple societies, which have all turned out to be unstable in the long run), human activities have been profoundly dominated by niche-increasing activity. This inevitably has put pressure on other species, especially those which humans perceive as competitive with them, or niche-limiting, such as the lion and the bear, the mosquito and the insect pests, the disease bacillus, and horse manure.

A fundamental problem arises, however, because virtually all human activity produces both goods and "bads," both things which are perceived as enhancing human life and those which are perceived as detracting from it. This is why we have pollution--not because there are wicked people who like to pollute things (this is a very minor element in the problem), but because if we want beef, we have to have polluting feedlots, if we want electric power, we have to have polluting power stations, and so on. A critical problem in the economy is how to make private decisions for private benefit also produce public benefits. We have to create Adam Smith's "invisible hand," which makes private and public benefits the same. There are particular difficulties here in the case of "public goods" and "public bads," which cannot be privately appropriated and can only be organized through a public political process. Otherwise, we get what Garrett Hardin has called the "tragedy of the commons," and the "invisible hand" then steals out of all our pockets. Many things which ecologists worry about, such as wilderness or the preservation of species, fall under the category of "public goods" which cannot be provided through private markets.

A very critical question is whether the human race is now approaching its ultimate niche. Can we go on expanding without ecological disaster? Is the human race just a fire weed that expanded because of a dynamic process which cannot be sustained? It is certainly possible to conceive of a sustainable high-level economy, but we are still a long way from the technology which can achieve this.

Today, ecology rather than economics seems to be taking on the role of the dismal science. All the dismal theorems, however, merely amount to saying that there are limitations. If these limitations are recognized and accepted, and organized action is directed towards them, there is no reason why they should be fatal. If we have, in fact, exceeded the human carrying capacity of the earth (and it is by no means clear that this is so), we will certainly have a rough time getting back to that capacity. There seems to be no inherent reason, however, why, once it has been achieved, a "spaceship earth" should not be both stable and reasonably agreeable.

PLANNING FOR QUALITY GROWTH

Dr. Shelley M. Mark*

Hawaii is the newest, one of the smallest, and probably the most environmentally fragile State of the Union. Because of its fabled climate and natural beauty, Hawaii is a prime attraction for tourists. Because of its strategic central Pacific location, it is a major military outpost. Because of fortuitous combinations of climate and soil, labor and capital, research and technology, it has supplied world markets with sugar, pineapple, and other tropical products. With this obvious interdependence between economic prosperity and environmental quality, Hawaii has long been concerned with protection and enhancement of its environment. Because of its small size, the threats to both environmental quality and economic life-blood are more readily recognized and preventive action more easily galvanized. Because the State is new (14 years old), it is not hampered by age-old structures, practices, and traditions, and is more apt to venture into pioneering approaches to solution of environmental problems.

THE HAWAIIAN LAND USE LAW

Hawaii's pioneering has been recognized nationally among specialists in land use control. In "The Quiet Revolution in Land Use Control," a major national survey prepared for the U. S. Council on Environmental Quality (December 15, 1961), the authors, Fred Bosselman and David Callies, wrote:

"It all began in Hawaii. The quiet revolution in land use control saw its first legislative success with the Hawaiian Legislature's passage of the Land Use Law in 1961. In the initial years after its passage, mainlanders typically brushed it aside as a strange phenomenon from a strange land. But now as other States begin reform of their land regulatory systems, it is increasingly apparent that Hawaii's ten years of administering a system of Statewide controls offers a valuable source of practical experience."

Hawaii's Land Use Law was itself a direct outgrowth of the nation's first State General Plan and remains an integral part of the State's planning and environmental management process. It was passed in response to certain worrisome environmental trends in the period just prior and subsequent to our attainment of Statehood. The State's usable lands are extremely limited; our prime agricultural lands were facing pressures from urban sprawl; scattered developments and speculative subdivisions raised questions of public costs vs. private benefits; the necessity to protect our shorelines and other scenic assets, our forest, water and other natural resources was clearly recognized. Thus, the Hawaii Land Use Law sought to preserve prime agricultural lands, to guide urban growth for more efficient use of public services and facilities, while permitting reasonable housing, commercial and industrial expansion, to establish a system for prudent management of our environmental resources.

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*Presented by Dr. Shelley M. Mark, Director, Department of Planning and Economic Development, State of Hawaii, at the National Conference on Managing the Environment.

The Land Use Law provides for a State Land Use Commission appointed by the Governor and confirmed by the Senate. The Commission is authorized (1) to classify all public and private lands in the State, in one of four classifications -- urban, rural, agricultural, and conservation, (2) to establish specific boundaries for each classification throughout the State, (3) to revise these district boundaries on the basis of a petition and hearings procedure or a mandated comprehensive review every five years, and (4) to prescribe general uses permitted in each district--with detailed uses in the urban, rural, and agricultural districts to be administered by the Counties and in the conservation district by the State Department of Land and Natural Resources.

Today, the State has detailed maps showing precisely which lands are in each classification. These district boundaries must be reviewed comprehensively every five years. Preparations for the next review in 1974 are now under way. The Land Use Commission also operates under specific regulations intended to clarify and implement the law.

Thus, we have had a State Land Use Law in effect for the last eleven years and a Land Use Commission for approximately the last nine years. What have been their impact and effect on the growth of our community and quality of our environment? As in most public and controversial bodies of this type, there have been opposing views and differing interpretations. At the time of the last mandated five-year boundary review in 1969, the planning firm of Eckbo, Dean, Austin and Williams of San Francisco noted these positive results: (1) the State Commission has been stricter than the Counties in approving petitions for rezoning; (2) scattered development -- with one or two notable exceptions -- had largely been brought to an end; (3) speculative subdivision of new lands beyond the need for new home sites had been greatly reduced; and (4) prime agricultural and conservation lands had been protected from urbanization.

Critics, however, have been concerned about continuing conversion of agricultural lands, especially the most highly productive ones, into urban use; speculation causing land and housing prices to rise while lands are withheld from use; and instances of a lack of coordination between State and County decisions, and between State zoning and State real property tax assessment practices. Issues have not been resolved, but the various attempts over the past decade to have the law repealed have been roundly defeated, while a number of key amendments strengthening the powers of the commission have been passed. This is not to say that the commission is one of the more popular institutions in the State.

ROLE OF COMPREHENSIVE STATE PLANNING IN LAND USE REGULATION

Our recent experience has emphasized that a State land use control policy can only be effective as part of a comprehensive planning program which embraces social, economic, environmental, administrative, and financial aspects. This planning has to be long-range, and requires coordination and interaction of functional plans by governmental and private agencies in order that the community's total resources be used to meet the needs of its citizens in optimal fashion. There is a strong need for comprehensive planning at the State level not only to examine and evaluate such functional plans (e.g., transportation, agriculture, recreation, education), but also to provide new insights, new directions, new information, new programs, and new methodologies for State government generally. Without this solid grounding in a comprehensive planning process, the flexibility deemed desirable in land use administration may easily become merely expedient, ad hoc actions.

The paucity of State general plans or of viable State comprehensive planning processes, however, indicates serious political obstacles not only to planning implementation, but to the concept of centralized planning itself. Thus, State planning agencies have been preoccupied with the search for relevance--for organizational structures or roles which may assure their existence amidst ever-changing Federal guidelines and ever-restive local jurisdictions. The end result of the State planning exercise has been to place the State planner in the Governor's office without either one knowing exactly what he was supposed to be doing there. In Hawaii's case, a relatively strong centralized government facilitated the passage of appropriate enabling legislation and the working out of administrative procedures necessary for the redistribution of traditional zoning powers. In the general case, this should not pose an insurmountable obstacle, since it is axiomatic that if a State can delegate its police power to regulate private land use in the public interest, it can also exercise it. The serious interest of a growing number of State and national officials in the Hawaiian experience, along with the expected passage of a National Land Use Policy act, suggests the sort of change in public climate which is necessary for any such exercise of power to occur.

THE STATES AND THE NEW FEDERALISM

The National Land Use Policy Act has been hailed as a principal means by which state and local governments will be assisted in making the transition from a chaotic crisis-by-crisis approach to a decision-making process based on rational long-range planning. This may yet be, although the measure in its current form does not move strongly in the direction of a "national policy" on land use. There are few national goals or guidelines, and the economic sanctions originally designed to compel compliance with the measure have been weakened. One possible outcome of the Act might be the emergence of fifty state variations of national land use policy.

The Act seeks (correctly) to build up State planning capability by providing funding, staff, a data and information base, and appropriate authority. Its approach is to focus available resources and expertise on "critical areas and uses of more than local concern." In so doing, it excludes existing incorporated areas in each State, which exercise often crucial planning and zoning powers, thus limiting its applicability. As the Hawaiian experience has demonstrated, land use policy needs to be long range in concept and application, and the planning upon which it is based should be comprehensive in scope and jurisdiction.

The Coastal Zone Management Act of 1972 makes State Governments the focal point in a related strategic area of environmental management. While the legislation does not require State participation, the prospect of Federal funds, as well as the privilege of requiring Federal projects and permits to conform with State management programs, are strong incentives. Without an approved State plan, Federal agencies could start projects without State approval. The law gives considerable freedom to States to do as they wish in coastal zones, but what they do and how well they do it will depend on how quickly they can firm up their planning capabilities and how willing they are directly to tackle the complex problems of inter-jurisdictional management.

Another example is the proposed special revenue-sharing Better Communities Act of 1973, which purports to strengthen the hand of state governments and governors, while at the same time providing for the bulk of funds to flow to cities and urban counties. Congress is concerned that these funds may not be used in ways responsive to national priorities, such as housing, and that States are being required to administer programs without the benefit of national growth policies. The net effect may be to give States certain added responsibilities, without providing them with the effective authority to carry them out.

There are numerous other elements of the New Federalism that I cannot touch upon. Nor does it seem appropriate to resurrect or renew the debate on whether it is indeed the way to solve the complex social and environmental management problems. For those interested in this issue, a recent New York Times column by Professor Henry Steele Commager states: "The notion that voluntarism and local authorities can deal effectively with the national and global problems which crowd about us is without support in logic or history" and concludes: "Only the national government has the constitutional authority, the financial resources, the administrative talent and the statesmanship to deal with these problems on a national scale."

These matters have been and will be decided at a higher level than state government by the interplay between the national administration and the Congress. While the debate continues and new legislation and guidelines are hammered out, the States have the opportunity to use the period of "creative pause" to solidify the character of their planning and develop their own initiatives in order to come to grips with the forthcoming programs.

The National Land Use Policy Act, the Coastal Zone Management Act, and the Better Communities Act urge states to take the first steps (for some) in this direction. The challenge to the States is whether they can build up their planning capabilities and develop their planning processes in order to deal with their most critical environmental management problems in a far-sighted and comprehensive manner. The mandate to the Federal government is not simply to satisfy itself that the States are doing this, but to coordinate its own divergent planning interests and set forth goals and guidelines appropriate to a true national growth policy.

Nevertheless, the States now have at least the opportunity, with Federal statutory and financial support, to set their own directions, and to delve into the bewildering complex of local jurisdictional problems that have hampered rational environmental and land use decision-making in the past.

In the past, State planning has been preoccupied with its search for relevance--for systems, structures and roles to insure its continued existence. For the future, State planning must start building substance within structure and directly face the environmental issues people are concerned with, no matter how difficult the task and unpromising the early returns.

PLANNING FOR QUALITY GROWTH

More than a decade ago, the people of Hawaii concluded that land is what matters, ultimately and environmentally. We passed our State Land Use Law, reflecting this realization and the desire of our people to establish rules and priorities for the use of our very limited land resources. The law was an outgrowth of these needs and its administration is an integral part of our comprehensive state planning process. In recent years our land use controls and planning process have become increasingly intertwined with a variety of policies, programs and projects which have as their common focus the quality growth of our State.

Public concern with quality growth has, of course, long preceded the recent legislative actions and popular discussions on the subject. In the Case of Berman v. Parker in 1954, Justice William Douglas wrote: "The concept of the public welfare is broad and inclusive...The values it represents are spiritual as well as physical, aesthetic as well as monetary. It is within the power of the legislature to determine that the community should be beautiful as well as healthy, spacious as well as clean, well balanced as well as carefully patrolled..."

Following perhaps from Justice Douglas' suggestions that "it is within the power of the legislature to determine that the community should be beautiful," the 1972 Hawaiian State Legislature passed a law, mandating that a Quality Growth Policy be developed for the State by the Chief Executive. This legislation was also a key recommendation of Stewart Udall's Comprehensive Open Space Plan and an outgrowth of his feeling that a meaningful open space program for the State could only be developed within the context of total environmental quality, with full consideration of population policies, urbanization patterns, resource uses, transportation alternatives and other man-made growth factors. Hence, the legislative mandate to halt urban sprawl, preserve open space, protect and enhance the environment of Hawaii and uplift our quality of life through the identification and implementation of fundamental State growth policies.

However, the passage of legislation does not assure quality growth in a state. It is a necessary first step; it provides the structure, but substance has to be provided within the structure before a government can effectively come to grips with its most pressing issues of environmental management. This is what state planning is all about, and this is where the States may seize the initiatives and opportunities promised them under the banner of the New Federalism.

Accepting quality growth is a proper focus for carrying out the mandates under the new Federal legislation; it is then possible to outline the main elements of a state planning process designed to achieve it. These include: (1) definition and standards of measurements, (2) identification of principal problems or issues, (3) addressing these issues in a systematic, comprehensive, and far-sighted manner, (4) devising the instruments appropriate to the solutions required, and (5) gaining popular understanding, acceptance, and support for both the process and its recommended solutions.

While quality growth is difficult to define or make operational, it is nevertheless a useful disciplinary concept. Generally, it suggests multi-dimensional growth that achieves a socially desirable balance among economic, social, and environmental elements. This is in basic contrast with "quantity growth" which emphasizes growth along traditional economic and population dimensions. However, it is incumbent on each state to develop its own, unique, operational definition of quality growth, which emphasizes local attitudes and priorities with respect to the appropriate balance between economic development and environmental protection.

Several basic problems must be overcome in attempting to develop a State quality growth policy. They include:

(1) arriving at a consensus on the appropriate balance among economic, social, and environmental objectives;

(2) achieving sufficient control over the rates and kinds of growth to be able to direct them toward a desirable balance; and

(3) gaining knowledge of the system which will allow us to predict the effects of our actions on different growth dimensions.

The major difficulty, of course, is that our system may be too "locked in" on quantitative, economic growth to be able to redirect itself toward quality growth. That is, economic and political self-interests are too tied into the present pattern of growth to allow for change.

The formidable challenge would be to devise a widely accepted policy, comprehensive planning process, and authoritative management program to break open these locks (to use a poor Washington analogy). Since quality growth is a change-oriented concept, a quality growth policy or planning process must also be change-oriented. At present no clear consensus exists on precisely what quality growth is and how it is to be achieved; hence, a planning process built around this concept cannot be rigid and inflexible. The process must be incremental and concerned with asking questions about growth and increasing our ability to deal with these questions and make decisions about them. Thus, the process must be "experimental" where feasible; it must be constantly generating new ideas and testing them.

The States will need to build or rebuild their planning information bases. Decision-makers need to be informed and pressed with the questions suggested by the concept of quality growth. They need to be apprised of the impact of different decisions. We can best build this information base by careful planning studies aimed at specific, manageable policy questions. As consensus is reached and our information is broadened, we can then increase the scope of our efforts. We cannot be overly comprehensive and still produce timely and useful plans and studies at the same time.

As much of the impending national legislation suggests, physical development controls will continue to be the major means available to government for implementing growth policies. These include land use controls, capital improvements programming, environmental quality standards, and actual public participation in the development process. Raising the quality of the man-made environment will require that government form a more effective partnership with the private sector in the development process.

Controls of some type are needed to force consideration of the full range of impacts of government policies and actions and private and public developments. The only available device of this type is the environmental impact statement. The rationale underlying the EIS procedure has generally been that the EIS was only a first step that would lead to other institutional changes designed to give greater weight to environmental considerations in decision-making. However, the changes have been slow in coming and the EIS is becoming an end in itself. What seems desperately needed also is an EIS on the EIS, which would relate it to the state planning process and provide harried readers with better criteria for judging whether they are good or bad.

The pragmatists will say the concept of quality growth is too elusive, that the means of attaining it are too obstructed by immutable self-interest, and that we lack the information, know-how and techniques to achieve our goals. Perhaps the way out is for each of us in planning and environmental management to broaden our perspectives further.

Governor John A. Burns offers us a clue in his 1973 "State of the State" message to the Hawaii Legislature: "At the heart of it, the central element in 'quality growth' is a social one: It involves people. It means the creating and improving of Hawaii's economic and social conditions so that all men, women and children in our Islands can retain the full sense of their human dignity and proper pride, through meaningful employment of their God-given talents and the pursuit of worthy personal objectives."

This is a broader view of "quality growth" than is customarily found in discussion of the environment. Perhaps there has been too narrow a perspective which sees only physical dimensions, urban design, the ideal placement of buildings, and preservation of open space. Perhaps the nation's concern about environment has put too much stress on capital improvements, city plans and economic plans and master plans and general plans--which limit our vision to the physical and economic elements of "quality growth." The new vision is to the growth of the human person, in an environment which he both shapes, and is shaped by. It is the only environment he has, and one which must bring him happiness and fulfillment. Quality growth through intelligent planning contributes to that goal.

ENVIRONMENTAL DECISION MAKING

John Wentz*

I have organized my remarks under five sections. First, I am going to give you my personal definition of the scope of environmental management. We have had some difference of opinion already on what that ought to be. Then I am going to suggest at least one of several ways to organize to accomplish something. I am going to note some changes in city operations, which are being and should be caused by our interest in the environment, highlighting, of course, the Phoenix experience. Then I am going to comment about the strategy of balancing the pressures that city officials are under, both pressures for action, and pressures for restraint or no action. Finally I will give just a brief comment on what the future may hold.

In defining the scope of environmental management, "life style" is perhaps the key term. It is the variable that we attempt to influence. Our objective is to enhance the quality of life style. The temptation is to get too broad, because life style is affected by many things, such as law and order, welfare, jobs, salaries, and social programs. All of these are important, and do affect the quality of life. For my definition, however, we should for the moment restrict our concern to the physical, visual, sensory aspects of the world around us. At least with this agreed upon, we may then accept as a goal that one stated in the summary report by the California Governor's Planning and Research Office, entitled "Environmental Goals and Policy."

The overall environmental goal for California,it states: "Is to create and maintain a productive harmony between man and his environment, the physical space in which he lives." The word "productive harmony" is important, because it does not mean all one direction or the other. It means a balance. Of course, it means the prevention of air and water pollution which we talk most about, as well as visual and landscape pollution. It means the use of management of our resources. Most important, it implies achieving a balance between the desire for quality of these surroundings, and a willingness to pay the bill.

Managing the environment, incidentally, is no different than managing anything else. It is simply applying conventional organization, research, education, and management practices to a new objective.

How does one organize to accomplish environmental management at a city level? There is no one right way; what works is correct. However, at least three elements are required in any organizational effort. One is enlightened citizen input; another is adequate staff. Third is interest and support of top management. If any one of those three is absent, we will probably fail.

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*Presented by John Wentz, City Manager, Phoenix, Arizona, at the National Conference on Managing the Environment

Enlightened citizen input is needed for two purposes. First, it provides the ideas and support that you receive from the citizens, and perhaps more subtly, provides an opportunity for them to become educated themselves about the problem.

A staff should consist of at least one or more persons devoting full time to the problem. I think that the problem today has become important enough so that it cannot be solved out of the hip pocket of a budget and research department, or planning department. It needs the interest and support of top management. Nothing without that support will get accomplished.

In Phoenix we are still in the embryonic stage, but moving, cautiously and deliberately, and with the full support of the mayor and the council. In July of 1971, the City Council of Phoenix, by ordinance, created a twenty-one member Environmental Quality Commission, with staggered three year terms, to function as a recommending body to the City Council, with primary duties to identify environmental problems. Their duty is also to recommend solutions of these problems to the Council. Upon careful study, this commission may recommend changes in regulations or policies, city procedures and programs, or it may hold public hearings to determine feelings of citizens. The latter is sometimes dangerous, but nonetheless, a useful device.

Another major objective of the commission is to create an awareness throughout the community of environmental problems and to encourage community cooperation in resolving those problems. The city planning department has created a staff environmental planner position to assist this commission in its work and to coordinate activities with the management staff. This professional staff member was hired through the Housing and Urban Development Comprehensive Planning Assistant Program. The direction for the environmental planner is very simple. It is to identify environmental issues, problems, and opportunities and to serve as an information source and contact point for city evaluation of environmental implications (including impact statements) and to facilitate the effective functioning of the citizens' commission.

The key to success will be the coordination of action to implement improvements or changes. The city manager's office and the mayor's staff will work closely with this commission, and assert sufficient thrust to the program through all departments.

Perhaps more important are some changes in the city operations caused by the current interest in the environment. When Phoenix addressed itself to this subject about two years ago, the first thing that we did was to examine what we were doing now that we had something to do with the environment. We found that we were already doing many things in the interest of environmental quality. I now propose to list these environmental activities in inventory form. For convenience I have organized these activities under the more or less responsible department.

With the aid of the planning department, the legislature recently passed the first state enabling legislation in the field of planning. This was a new accomplishment for us. It includes sections on the conservation element of natural resources and also a recreation element. It allows the establishment of flood plain zoning and provides the municipality with power to reserve parks and recreational facilities within subdivisions.

In the planning department we have also adopted a number of hillside ordinances, which will control the quality of development on those hills that we are going to allow to be developed. We have developed three ordinances: (1) a grading and drainage ordinance; (2) an amendment to the zoning ordinance; and (3) an amendment to the subdivision ordinance, all of which control size of lot, or what you do, for example, with the cut and fill, steepness of driveway, and the runoff. The most important end result of these laws is to reduce the density. The developers, of course, bitterly opposed these regulations. However, they have been adopted.

We have adopted the theory of density transfer in the design of PAD's -- planned area developments. We allow a slightly heavy density in the flatland in return for keeping the hillside open.

We have gone into the sign business. That falls under visual pollution. We have stepped up our enforcement by doubling our fees and doubling the number of staff, starting a perpetual inventory, and requiring a bi-annual permit to maintain the inventory. We are cutting down rather heavily, for a large city, on signs. We are also studying amendments which may further crack down on the visual pollution from signs.

We are working very closely with the FHA in requiring back-up treatment for residential development so that we will have no more "Allen's Alleys" or those bleak backwalls along major streets.

Under the park department, we are working hard to develop a greater street tree planting program. Nurseries are being built in order to grow stock economically. Many of our street tree planting programs along major boulevards are purposely concentrated in the inner city area. What we call a slum looks pretty good compared to the eastern slum, even though for Phoenix it is a depressed area. Beautifully landscaped center strips and towering palm trees can be seen in this neighborhood as though it were on Sunset Boulevard. This type of improvement helps to raise the spirits of that portion of our community.

The most exciting thing we have done recently is to get into the open space program in a major way. In this regard we are indeed following the advice of the man for whom I am pinch hitting, Mayor Pete Wilson of San Diego, who has said:

> Land use really is the starting point of most of man's polluting activities. Land dedicated to park or open space makes a significant contribution to environmental quality in two ways. It is enjoyable both in itself and also for the relief

> it provides from other surrounding and polluting land uses. It may be that the greatest contribution cities could make to improve their quality of life is the acquisition of as many desirable parcels as possible, as early as possible, before land prices soar out of range or compel development and permanent loss of open space. The time is now -- before it is too late.

The city already has the largest municipal park in the United States. It includes approximately 15,000 acres of mountain area and is called South Mountain Park. It is a desert park on the south end of the town. In the middle part of the city is a large mountain range called the Phoenix Mountains. For years people have been worrying about how urbanization would affect these mountains. It became perfectly obvious what was going to happen when people began to creep up the sides and build. If something were not done, it would soon become the Hollywood Hills all over again. We had a consultant do a study to determine what he thought might be done about this open space. He recommended that we preserve it, which was a rather simple recommendation although it will cost $40 million. It is all privately owned. We did not know how to cope with that, so we appointed a citizens committee. It consisted of 125 members, and was called the Phoenix Mountains Preservation Commission. Some people criticized the Commission because of its size. We broke it down into sub-committees, and eventually they developed a financing plan. They had a little help from the staff, but it was basically their own plan. They also came up with a plan for selling the idea to the community.

Last Tuesday the citizens voted by a two to one margin a $22.5 million bond issue to help buy those "rocks." We are pledging $13.5 million of our federal revenue sharing funds toward it. The rest will come from federal revenue sharing, which should continue past the first five years. We are starting out very aggressively to buy this 9,000 acre mountain range and have already spent about $3 million from accumulated funds. It will be an open preserve of pristine quality in a densely populated area.

On the west side of the city we are buying, with the assistance of HUD open space grants, land along a dry creek. Eventually this will be Cave Creek Regional Park, a strip of land seven miles long with golf courses on former sanitary land fills and a variety of other open space uses. Beyond the present city limits to the north we are obtaining from the Bureau of Land Management large mountain areas which will eventually become regional parks. One such area of about 1,000 acres will be combined with a sanitary land fill of 900 acres to form, in twenty-five to thirty years, the Skunk Creek - Deems Hills Regional Park.

Another stimulating project is the current Rio Salado study under the auspices of the Maricope Association of Governments, our local COG. This proposes to develop the waste land along the normally dry Salt River for a distance of forty miles through the valley with recreation and economic uses.

Downtown, in the interest of open space, we are also spending some federal revenue sharing money to buy a downtown block, demolish a number of pawnshops, and make a Pershing Square out of it. It is the anchor of our governmental mall. We are also buying five blocks in the governmental mall, along with other governmental agencies, so that it will stretch from the city hall to the state capitol someday, fifteen blocks long, with an open green sword going down between. This project is striking a blow toward improving the environment, and we are having a lot of fun doing it.

In the water and sewer area, the city is improving the appearance of many of its facilities by painting and landscaping. Most exciting, however, are the experiments using the effluent from the sewage treatment plant. One project is funded by an EPA grant and is trying to determine, with the help of ASU, how we can purify the water somewhat more, so that it can be used for the purpose of irrigation of truckfarm crops. We are already selling 70,000 acre feet of our effluent to an irrigation district, which is using it for forage crops. We have not yet reached the point of using it for edible truckfarming crops.

Six cities, all using the same sewage plant as Phoenix, have agreed to sell the waste product from the sewage plant to the ANPP, which is the Arizona Nuclear Power Project. It will be the first nuclear power plant to use sewage as cooling water. That is a very productive use for sewage. In addition, we will receive between twenty and thirty dollars per acre-foot for it. That is probably the highest priced sewage in the country.

Under the engineering department, we are requiring contractors to dispose of their soil in landfill, instead of laying it over the desert (which is tempting, because there is so much of it). We are entering into an expensive service center beautification program. These centers house the refuse and street department trucks; we are landscaping them heavily. Our Omaha orange colored trucks, which used to be thought desirable from the standpoint of safety, are being changed to desert beige so that they blend into the landscape. These are simple, little things, but they are all in line with the general movement. They give us a chance to score a few minor victories early in the game and to build up some momentum for the program.

In the city manager's office, we run an inner city neighborhood environmental improvement program headed by an administrative assistant in charge of our south Phoenix branch office of the mayor and city manager. He is coordinating activities of various operating departments on a block by block, boot-strapping basis, working through neighborhood councils of the city's CAP agency (known as LEAP), which operates as a department of the city in Phoenix.

In summary, while some of these actions probably would have occurred anyway in the society twenty years ago, most of them are possible now only because of the tolerance and the support of the public.

For the strategy of balancing pressures for action and restraint, we need a check system for pre-analysis of the environmental aspects of all new projects. The potential environmental impact of a project must be determined before a project is built. We need a better, more objective cost-benefit analysis. This is the main issue in environmental protection. How much are you willing to pay to have the kind of environment you want? We need more citizen involvement, certainly far beyond the commission. Several area planning councils have been established in our city, and they are very active, not only in planning their areas, but in environmental concerns.

We are working through our neighborhood councils in the depressed areas. We believe that the people in the disadvantaged areas have just as great a stake in the environment as anyone else. One of the greatest problems is understanding the alternatives. For example, we have a freeway problem in our city. In a recent poll, people voted to abandon a freeway which was ten years in the planning. Nobody in the community thought seriously about possible alternatives, but they have decided against the freeway. Now we have the problem of a massive educational program of trying to determine how to preserve our mobility.

How do we cope with these two pressures? Pressures for precipitative or unreasonable action are offset by strong organization and objective research and analysis. Pressures for restraint are offset by good education and good citizen involvement. It is a delicate balance, but those of us at the local level are experienced, or should be, in maintaining that delicate balance.

What does the future hold? The environmental issues will remain. The only question is: what action are we going to take? Interest will remain high. The management of the environment will become more realistic and more down to earth as accomplishments prove successful, as we achieve some minor victories along the line of the Lindblom theory of incremental approach.

The involvement of pragmatic administrative officials will balance the enthusiasm of impractical activists in order to achieve a productive balance. We are not going to return to caveman life. The era of growth, expansion, and exploitation is peaking. The era of consolidation, of polishing off the rough edges, of emphasis on improving the life style, is on the rise.

It behooves government and industry managers to pay attention to these indicators. They must and will be in the forefront of action programs for two reasons. First, to balance the unrealistic emotional demands of certain members of the society and second, to ensure that something really gets done.

INCREMENTALISM AND ENVIRONMENTALISM

Charles Lindblom*

In simplest form, the answer to the question "How are we to translate broad goals and comprehensive plans into action programs" is "Don't!" That does not mean that I oppose action programs. I support action programs. I also advocate planning. What I bridle at is stress on the breadth of goal and the comprehensiveness of plan.

The axiom that plans ought to be comprehensive and goals ought to be broad which is an axiom many of us take for granted, indicates that the study of planning and policy making and the practice of them and still in their infancy. On any kind of sober view of how to go about planning and goal setting, two attributes of action programs to beware of are breadth and comprehensiveness.

As I see the world of policy-making or the study of decision-making, there are fundamentally--speaking very broadly--two hypothetical alternative approaches to making intelligent decisions on complex matters. The first is to aspire with never ending frustration to be comprehensive, broad and complete, to wrap up together all aspects of a program, to master it intellectually, to comprehend it in all aspects. To succeed in this is, however, in actual fact impossible. For any complex problem, it cannot be done. I am not on that point idiosyncratic. If you examine some of the rich contributions to the literature on policy-making and decision-making, particularly in the last ten or fifteen years, you will see that an increasing number of people recognize that these are really foolish aspirations, since one cannot be comprehensive, one cannot be complete, one cannot be competently broad (only erratically broad) for complex problems.

The alternative and feasible method, therefore, of getting into action programs, or thinking intelligently, or acting intelligently, on complex problems -- the problems we face in the public policy and environmental fields -- is to be discriminating, selective, corner cutting, tricky, cunning, strategic, and tactical. The second broad alternative is to recognize that we must reach a decision before we have intellectually mastered the problem and that we will somehow have to make a decision and begin to act long before all the facts are in. We shall have to come to some kind of conclusion long before we can achieve any kind of comprehensive or broad mastery of a plan.

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*Presented by Charles Lindblom, Professor, Yale University, at the National Conference on Managing the Environment.

What a skillful planner ought to do consequently is to ask, "What are the defensible, skillful, or tackically useful ways to cut corners? What are the defensible ways to leave things out? What are the defensible ways, to put it crudely, to botch a job, since all policy-making is going to be botched to some significant degree?" The decision maker must face up to the fact that he is going to make mistakes. He must decide, therefore, how to pick and choose among elements of his problem in order to devise in some skillful, imaginative way a realizable solution. His will be a method full of error, but errors that are somehow easier to live with or more correctable than others or errors that give him more feedback information for future decision steps than do others. Skill in policy-making, talent, inventiveness, or genius is not in pursuing the will-o'the-wisp of breadth and comprehensiveness, but in developing a kind of low cunning or brilliance in improvisation, in tactics for corner cutting, in learning a high degree of selectivity and discrimination, in making up highly focused rather than broad attacks on problems. Good action programs should lay out sequences of attacks, so that sustained attack may be sustained in the face of repeated inevitable error and in fact draw information through feedback from that error to make the sustained attack increasingly well-focused and precise.

Why planners resist the common sense choice between the impossible and the possible - why they often persist in broad goals and comprehensive plans -- needs explaining. Several considerations throw light on why we are wedded to the old-fashioned axiom that the way to be intelligent about policy is to be broad and comprehensive, instead of selective and strategic.

One is that this old axiom is conventional scholarly wisdom. We draw our canons of good policy making procedures from the scientific method. In a conventional understanding of the scientific method, man attempts to grasp, to master, to understand, to comprehend. Consequently, all the prestige of science bolsters the conventional notion that these are virtues for policy makers too, regardless of the complexity of policy problems when compared to the relatively constrained scientific problems that most scientists deal with in their own academic work.

Second, modest and realistic tactical or strategic selective approach to policy is painstaking hard work and not very exciting. It requires that social change be smuggled into the social system, rather than introduced with flags flying. Many of us recoil from meticulous, persistent repair work and lunge off in the direction of glamorous comprehensive plans. We may do so for the same reason that many people enjoy buying something new as therapy. Comprehensive planning is one of the great therapies of hard-pressed policy-makers. It is a way of getting into something fresh and new. Among its other attractions are the minor therapies of white paper and unsoiled notes instead of messy old files and the dismal record of past failures.

A third reason for a bias toward the broad and comprehensive is that most of us believe that because we became involved in our environmental difficulties piecemeal, we shall have to get out comprehensively. If piecemeal gradualism was the way that we blundered into our environmental problems, then clearly we shall have to devise some other method to get out.

Clearly the argument contains a fallacy. We did fall into our environmental problems through piecemeal gradualism. That still leaves open the possibility that the same route is the only route out of the problems. There are no logical defenses for "in one door, out another."

Finally, many of us resist selective, highly focussed programs because we now understand that the environment is all interconnected. It is a system. We are deeply impressed as we have never been before with the interrelation of parts. Believing,then, that everything is interconnected, we fall into the logical fallacy of believing the only way to improve those interconnections is to deal with them all at once.

Clearly, everything is connected. But because everything is connected, it is beyond our capacity to manipulate variables comprehensively. Because everything is interconnected, the whole of the environmental problem is beyond our capacity to control in one unified policy. We have to find critical points of intervention - tactically defensible, or strategically defensible points of intervention.

I have presented two models -- the traditional, conventionally scientific method of policy-making, and the other, the much more highly selective, incremental, tactical focussed method of policy-making. There is no doubt about which one we can more skillfully exploit.

CHAPTER III: ORGANIZING FOR ENVIRONMENTAL MANAGEMENT

"It appears that the awareness level of the citizens throughout the United States is centering a growing concern for the environment on the various governing bodies and their staffs to effect meaningful programs..." This citizen concern, as noted by Richard Gray, City Manager of Norman, Oklahoma, opening the discussion of "Local Government Experience," has been communicated clearly to public officials at all levels of government. The resulting rise of environmental awareness and the increase in environmental programs have been accompanied by changes in the organization for environmental management.

One of the fundamental tasks of managers is organizing available resources to address specific problems. Because organizing involves the distribution of an agency's resources -- staff (size, expertise, and role), budget, and authority -- it is one of the crucial determinants of program success. An "organizing" decision is made on every problem facing a manager, even when the decision is not to make an organizational change and to address problems through existing arrangements.

The manager's decision on "organizing" depends upon his perception of the problem. Environmental problems can be viewed narrowly or broadly. For example, exceeding the capacity of the sewage treatment plant and dumping untreated sewage into a river can be seen as either too small a plant or unbalanced (or too much) urban development. Most likely a manager would address these two problems quite differently.

Other factors that influence "organizing" decisions include: political pressures, financial status, federal or state requirements, existing staff capabilities, relation to other policies and programs, and the personal knowledge and skill of the manager.

In making organizational decisions, it is necessary to consider the dynamics of the organization that will exist after the decision is made. An organization can be described as a system of mutually dependent variables, including: the individual, formal arrangement of functions, informal arrangement of functions, behavior patterns resulting from role requirements of the organization and role perceptions by the individual, and the physical environment. All of these factors should be considered in planning organizational changes as well as for evaluating organizational effectiveness. The remainder of this chapter, however, will deal mainly with the formal arrangement of functions.

Lynton Caldwell stated that "the ultimate task of environmental quality agencies at all political levels, and especially at the top of each administrative hierarchy is a task of synthesis."* He concluded that the current fragmented responsibility for environmental programs throughout several agencies is not conducive to the task of synthesis, and therefore new organizational structures are needed. The following discussion examines current organizational developments at the federal, state and local levels. Since experience with new environmental organizational units is somewhat limited in scope as well as time, little evaluation or analysis has been made. It is all the more important, therefore, to stimulate a dialogue on the subject of organizing for environmental management so that experiences can be shared and previously encountered successes or problems can be sought or avoided.

CONSOLIDATING ENVIRONMENTAL FUNCTIONS WITHIN THE FEDERAL GOVERNMENT

The administrative organization of environmental functions has long been a concern of the federal government existing prior to the creation of the Department of the Interior in 1849. In more recent times (1932) President Hoover submitted a plan to Congress proposing to transfer the Corps of Engineers' civil functions to the Department of the Interior. Congress turned down the plan. Later, in 1937 the President's Committee on Administrative Management recommended that the Department of the Interior be retitled Department of Conservation. This, too, failed. Other minor changes were advocated by the Hoover Commissions of 1949 and 1955.

After World War II, programs developed for air and water pollution, solid waste, and part of the pesticide and radiation programs were grouped together as part of the Bureau of State Services in the Public Health Service. The Water Quality Act of 1965 removed the water pollution program from the Public Health Service and created a new Federal Water Pollution Control Administration within the Department of Health, Education and Welfare (HEW). Before this change had time to take effect, however, President Johnson submitted to Congress a reorganization plan transferring the Water Pollution Control Administration to the Department of the Interior. Following the transfer of water programs to Interior, there were a series of reorganizations within HEW. First came the creation of the Bureau of Disease Prevention and Environmental Control. This was superceded by the Consumer Protection and Environmental Health Service, which was in turn converted into the Environmental Health Service.

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*Lynton Caldwell, "Environmental Quality as an Administrative Problem," _An Anthology of Selected Readings for the National Conference on Managing the Environment_, p. III-11

An important move toward consolidating environmental responsibilities occurred in 1969 when the Council on Environmental Quality (CEQ) was established by statute (the National Environmental Policy Act) to provide top-level policy advice and coordination in the environmental area. The CEQ is the only major part of the Executive Office of the President devoted exclusively to a particular substantive policy area. The rationale for making this exception is the special nature of the environmental problem, affecting the entire fabric of the federal government.

The second major organizational change was the consolidation of all the major pollution control programs under the Environmental Protection Agency (EPA). The creation of EPA was recommended by the President's Advisory Council on Executive Organization. The Council's recommendation was accepted by President Nixon, who sent it to Congress as Reorganization Plan Number 3 of 1970. In his message to Congress, President Nixon criticized the existing piecemeal approach and stated that "our national government today is not structured to make a coordinated attack on the pollutants which debase the air we breathe, the water we drink, and the land that grows our food..."*

On December 2, 1970, EPA came into existence by Executive Order 1170. EPA inherited $1.4 billion in appropriations, twenty-one diverse grant programs, and 5,400 people in 157 locations. Placed in the agency were programs from five departments and independent agencies, including the Interior Department's Federal Water Quality Administration; the HEW Department's National Air Pollution Control Administration, Bureau of Solid Waste and Bureau of Water Hygiene; pesticide registration, research and regulation functions of Agriculture, Interior, and HEW Departments; and certain radiation functions of the Atomic Energy Commission, the Federal Radiation Council and HEW's Bureau of Radiological Health.

Major program omissions were: (1) the authority retained by the Food and Drug Administration to confiscate pesticide-contaminated food; (2) the HUD sewer construction program; and (3) programs for community environmental health (mainly rat control and lead paint control) in HEW.

Details of the initial organization were worked out by a fifteen member task force from a variety of federal agencies (not directly affected by the organization) under the auspices of the Office of Management and Budget. The two primary organizational goals which shaped the development of EPA were: (1) functional organization and (2) decentralization.

*Richard Corrigan, "Agency Report/EPA Ending Year-Long Shakedown Cruise...," National Journal, October 9, 1971, p. 2042

An interim organization was created featuring five topical "offices" for water, air, radiation, pesticides, and solid waste, each headed by a commissioner. On April 30, 1971, a major reorganization occurred; since then, all subsequent changes have been modifications of that structure. The basis for the organization is partly along "functional" lines -- Planning and Management, Research and Development, Enforcement and General Counsel -- and partly in "program" lines -- Air and Water Programs, Categorical Programs (radiation, solid waste, pesticides, noise, etc.). EPA also gave priority to decentralizing its operations as much as possible to the ten regional offices. Regional administrators were given a broad charge by an internal EPA Order (No. 1110.19) to "develop, propose and implement an approved regional program for comprehensive and integrated environmental protection activities; be responsible for accomplishing national program objectives within the region; and exercise approved authority for implementation plans." On June 28, 1971, the regional offices were reorganized along the more functional lines of the national office.

There is no doubt that the development of an integrated organization has been a difficult task. William Ruckelshaus commented that "when I first came into this job, I said it would take three months to get settled... For nine months we've put up with peoples' jobs changing and with uncertainty about who will be located where and who will be responsible to whom."*

Some of the chief obstacles initially facing the new organization were: (1) physical separation of employees -- originally there were ten locations in Washington, D. C. alone; (2) pressures from statutory timetables and other sources to get on with the job; (3) lack of senior career administrators and key technical personnel in several program areas; (4) delay in determining precisely which people, funds and facilities belonged to EPA; (5) difficulty in realigning budgets; (6) establishing jurisdictions among organizational units; (7) individual resistance to change; (8) reluctance by central offices to surrender powers to regional counterparts; and, (9) attempting to decentralize before centralization had been achieved. During the first year of its existence, EPA tackled these obstacles while carrying out its other duties as well.

According to Howard Messner, EPA Deputy Assistant Administrator for Administration, some of the benefits which the organizational changes were intended to effect were tighter administrative control, freer communication, simplified lines of authority, and greater accountability.+

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*Robert Gillette, "Environmental Protection Agency: Chaos or Creative Tension," Science, August 20, 1971, p. 703.

+Ibid. p. 707

The most recent attempt to reorganize environmental programs in the Federal Government began in June, 1970, when the Public Land Law Review Commission proposed the creation of a Department of Natural Resources. This proposal was incorporated by the President in his reorganization program announced in March, 1971. The proposed Department of Natural Resources would include the present Department of the Interior, plus the Forest Service and the Soil and Water Conservation programs from the Department of Agriculture, civilian functions of the Army Corps of Engineers, civil functions of the Atomic Energy Commission, the Water Resources Council, the oil and gas pipeline safety functions of the Department of Transportation, and the National Oceanic and Atmospheric Administration from the Department of Commerce. The U. S. Environmental Protection Agency and Council on Environmental Quality would not be affected. At the time of this article, the reorganization plan has failed to win the approval of Congress.

In a speech delivered at the Conference, "A Positive Approach to Environmental Management," Lynton Caldwell, Professor at Indiana University, reviewed the forces leading to the creation of CEQ and EPA and recommended another organizational change at the National level -- the establishment of an Environmental Reconstruction Agency. Caldwell's explanation of how this agency would be able to respond to environmental problems of the future can be found in the selected papers following this discussion.

CHANGING STATE ORGANIZATION FOR ENVIRONMENTAL MANAGEMENT

According to a report issued by the Council of State Governments, approximately forty state legislatures enacted laws to preserve environmental quality during 1971. Actions were taken on a broad spectrum of programs, from wetlands protections, land use controls, and noise regulations to administrative reorganizations. The Citizens Conference on State Legislatures reported that six states now allow citizens to file suits aginst pollutors -- Michigan, Connecticut, Florida, Massachusetts, Minnesota, and Nebraska. As with the federal government, states have responded to the increasing concern of their citizens over environmental quality by adopting larger appropriations for environmental programs as well as more comprehensive environmental controls. Most of these actions have occurred since 1970.

As states assume greater environmental responsibilities, they are frequently inhibited by archaic governmental frameworks. Legal authority is frequently inadequate. Institutions created in the 19th century are ill-equipped to deal effectively with environmental problems which are complex and interdependent and have radically changed in scope over the past twenty years. Elizabeth Haskell reported in Managing the Environment: Nine States Look for New Answers that "Not only were environmental institutions coming under fire, but, by 1970, a general complaint has surfaced that government agencies of all kinds and at all levels were not able to respond effectively and swiftly to new social needs. But, this 'institutional lag' of organizations behind problems is particularly unacceptable when a politically popular issue, such as the environment, is affected."*

Even when the role of states in environmental management was more restricted, management responsibility was dispersed throughout the administrative organization. In general, state organizations were bulky assemblages of elected and appointed boards and agencies. Environmental responsibilities were fragmented between several boards, e.g., Conservation Commission, Natural Resources Council, Development Commission, Health Commission, and the like (See Figure 1). These boards usually possessed policy making duties, if not full administrative responsibility.

As states began to centralize or integrate their organizations, environmental functions came to reside in a few state agencies such as the Health Department, or Conservation Department. Reorganization efforts generally developed along six main themes: "(1) concentration of authority and responsibility, (2) departmentalization or functional integration, (3) undesirability of boards for purely administrative work, (4) coordination of the staff services of administration, (5) provision for an independent audit, and (6) recognition of governor's cabinet."+

By 1912, all states had created an administrative unit for health functions.‡ The first health departments were controlled by a board or commission. Some were interagency boards, drawn from other state agencies, other boards were composed of private citizens, representing both political parties, appointed for a specific term by the Governor. Gradually, however, the boards tended to lose their administrative authority and to become predominantly advisory bodies.

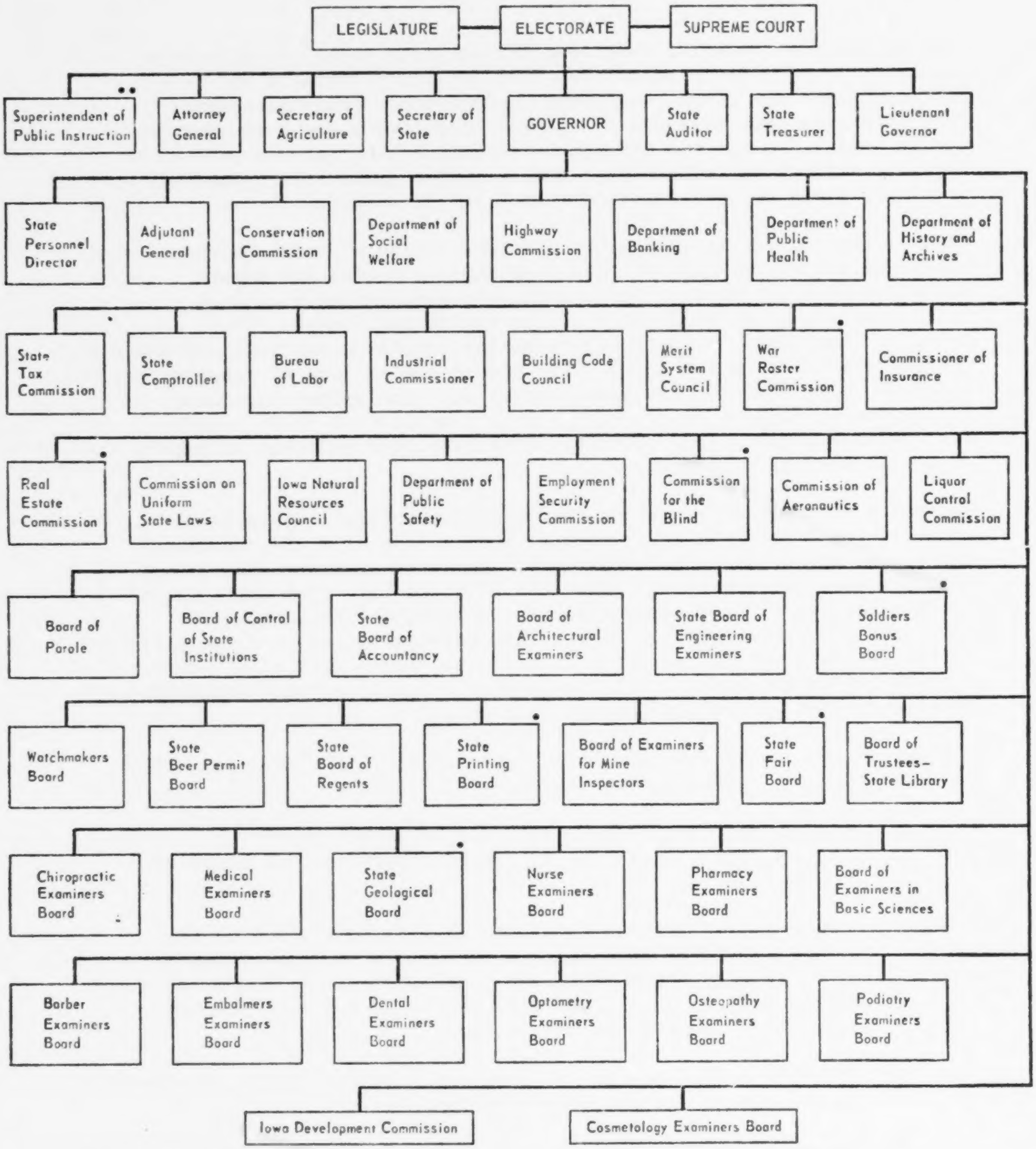
While no pattern existed for the functions performed by state health departments, the more common functions as reflected in the administrative structure were: (1) vital statistics, (2) communicable disease control, (3) public health laboratories, (4) industrial public health, (5) food and drug inspection, and (6) environmental sanitation. The environmental sanitation section often included activities in the areas of water pollution, sewage disposal, solid waste disposal, and the like. While this section often consolidated existing pollution control staff responsibilities in a single division, the division was often not particularly prominant in the departmental structure and competed with many other programs for staff and funds.

*Elizabeth Haskell, Managing the Environment: Nine States Look for New Answers, April, 1971

+A. E. Buck, The Reorganization of State Governments in the United States (New York: Columbia University Press, 1938), p. 20.

‡Wilson G. Smillie, Public Health Administration in the United States (2nd ed.; New York: Macmillan Co., 1940), p. 369.

Figure 1. Administrative Structure of Iowa Prior to Reorganization


LEGISLATURE
ELECTORATE
SUPREME COURT
Superintendent of Public Instruction ••
Attorney General
Secretary of Agriculture
Secretary of State
GOVERNOR
State Auditor
State Treasurer
Lieutenant Governor
State Personnel Director
Adjutant General
Conservation Commission
Department of Social Welfare
Highway Commission
Department of Banking
Department of Public Health
Department of History and Archives
State Tax Commission •
State Comptroller
Bureau of Labor
Industrial Commissioner
Building Code Council
Merit System Council
War Roster Commission •
Commissioner of Insurance
Real Estate Commission •
Commission on Uniform State Laws
Iowa Natural Resources Council
Department of Public Safety
Employment Security Commission
Commission for the Blind •
Commission of Aeronautics
Liquor Control Commission
Board of Parole
Board of Control of State Institutions
State Board of Accountancy
Board of Architectural Examiners
State Board of Engineering Examiners
Soldiers Bonus Board •
Watchmakers Board
State Beer Permit Board
State Board of Regents
State Printing Board •
Board of Examiners for Mine Inspectors
State Fair Board •
Board of Trustees—State Library
Chiropractic Examiners Board
Medical Examiners Board
State Geological Board •
Nurse Examiners Board
Pharmacy Examiners Board
Board of Examiners in Basic Sciences
Barber Examiners Board
Embalmers Examiners Board
Dental Examiners Board
Optometry Examiners Board
Osteopathy Examiners Board
Podiatry Examiners Board
Iowa Development Commission
Cosmetology Examiners Board

• Membership Ex officio either whole or in part.

• • Appointed by State Board of Public Instruction.

[Source: Russell M. Ross, *Government and Administration of Iowa* (New York: Thomas Y. Crowell Co., 1957).]

Sharing the environmental functions at the state level, conservation departments contained programs for fish, wildlife, forests and parks. These programs are often considered "promotional" programs because they generally regulated use of natural resources while encouraging use as well. The various sportsmen--fishermen, hunters--as well as resource extracting industries--such as lumber companies--frequently developed close working relationships with the agency.

Federal legislation in the 1950's provided financial incentives to encourage states to form Air Pollution Control Boards and Water Pollution Control Boards. The boards were established either as independent agencies or as part of the Health Department. Their principal functions included policy-making, standard setting, and appeals. Most of these boards are still in existence due to federal requirements, although many other of the state boards and commissions have been eliminated or consolidated. Most recently members of these boards from private industry and municipalities have been attacked in regard to possible conflict of interest.

Beginning in 1970 and following the lead of the federal government in establishing a separate environmental agency (the U. S. Environmental Protection Agency), several states followed with separate departments of their own (see Table 1). It should be noted here that these recent reorganizations did not succeed in centralizing all environmental functions under one agency. Other state agencies often hold responsibilities for such activities as: soil and water conservation, agriculture, forestry, fish and game, state parks, public lands, natural resources, water resources, mines and geology, and extension services.

The reorganization of environmental functions by states have generally been made for the following reasons:

1. "Consolidate fragmented activities to make program administration match the integrative way problems occur in the environment.

2. Reduce the proliferation of boards and commissions to make state government more manageable, and in some cases change their role and composition to 'professionalize' state environmental policy-making, and make policy-makers more responsive to elected leaders and the public.

3. Transfer pollution control programs from the health department to broaden pollution concerns beyond health.

4. Create a stronger regulatory role for the state and an agency advocate for the environment.

TABLE 1

STATE ENVIRONMENTAL DEPARTMENT

Alabama	Department of Conservation and Natural Resources
Alaska	Department of Environmental Conservation
Arkansas	Department of Pollution Control and Ecology
California	Department of Environmental Protection
Connecticut	Department of Environmental Protection
Delaware	Department of Natural Resources and Environmental Control
Georgia	Department of Natural Resources
Illinois	Environmental Protection Agency
Iowa	Department of Environmental Quality
Maine	Department of Environmental Services
Maryland	Maryland Environmental Service
Minnesota	Pollution Control Agency

TABLE 1 (cont)

STATE ENVIRONMENTAL DEPARTMENT

Nebraska	Department of Environmental Control
Nevada	Environmental Protection Commission
New Jersey	Department of Environmental Protection
New York	Department of Environmental Conservation
Ohio	Environmental Protection Agency
Oregon	Department of Environmental Quality
Pennsylvania	Department of Environmental Resources
South Dakota	Department of Environmental Protection
Vermont	Agency of Environmental Conservation
Washington	Department of Ecology
Wisconsin	Department of Natural Resources

Primary Source: Conservation Directory, 1972, Wildlife Foundation

5. Design a new environmental department that will be more publicly visible, thus demonstrating the state's commitment to environmental protection and rallying environment interest groups to form a stronger political base for environmental control.

6. Increase accountability of public officials and public programs.

7. Facilitate administrative efficiencies."*

Changing organizations for environmental management has taken different forms in different states. The actions of several states, such as Minnesota, have simply combined the pollution control programs into a single agency. Other states, notably Wisconsin and New York, have attempted to consolidate both pollution control and natural resource programs. A more detailed explanation of the alternative organizational structures and their relative merits can be found in Elizabeth Haskell's paper, "State Governments Tackle Pollution," later in this chapter.

Internal organization of these agencies is based on either program categories (e.g., air, water, solid waste) or function (e.g., planning, research, standard setting, enforcement). An example of the functional organization adopted in Ohio is shown in Figure 2.

The specific organizational structure utilized by the various states depends upon the state's perception of their environmental problems, the political setting, legal framework and a number of other factors. For these reasons, it is seldom that any two states have exactly the same combination of environmental agencies.

ORGANIZING LOCAL GOVERNMENT FOR ENVIRONMENTAL MANAGEMENT

As local governments have assumed responsibility for various environmental programs, such as water supply, sewage treatment, solid waste disposal, and parks, they have traditionally established distinct organizational units based on those programs, e.g., Sanitation Department, Water Department, Refuse Department or Parks Department. Other local departments with environmental responsibilities might include the Planning Department, Health Department, and Inspections Department. Attempts at consolidation led to the creation of Public Works Departments that include some or all of the following activities: engineering, street cleaning and maintenance, traffic control, street lighting, water, sewage, refuse, inspectional services, and equipment management (see Figure 3). Pollution control functions are generally located in the local health agency, either city or county sponsored (see Figure 4).

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*Haskell, Elizabeth, Managing the Environment: Nine States Look for New Answers, April, 1971, p. 11-12.

Figure 2. Organizational Structure of the Ohio Environmental Protection Agency

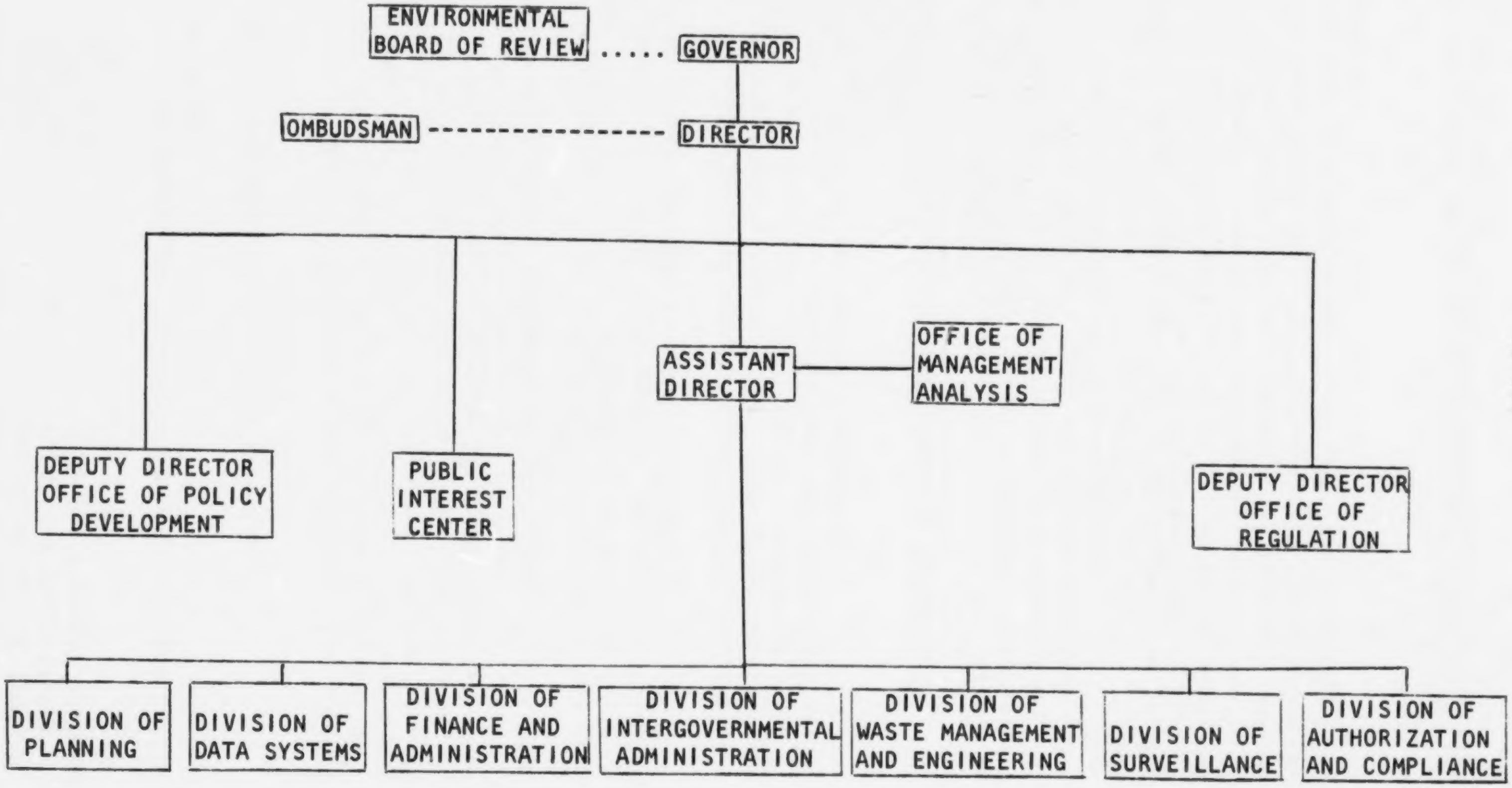
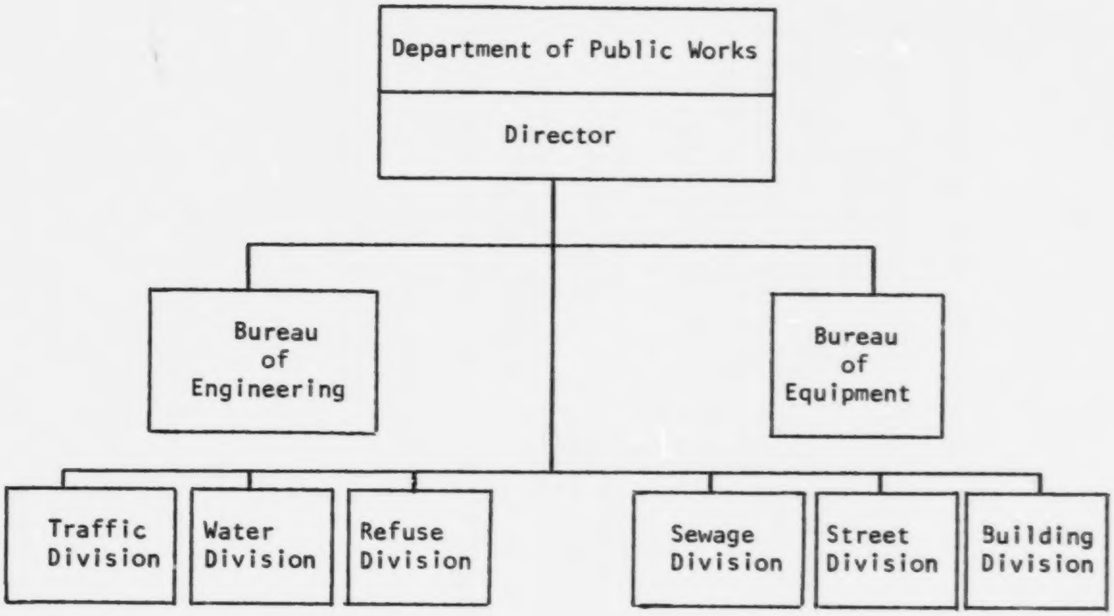

ENVIRONMENTAL BOARD OF REVIEW
GOVERNOR
OMBUDSMAN
DIRECTOR
ASSISTANT DIRECTOR
OFFICE OF MANAGEMENT ANALYSIS
DEPUTY DIRECTOR OFFICE OF POLICY DEVELOPMENT
PUBLIC INTEREST CENTER
DEPUTY DIRECTOR OFFICE OF REGULATION
DIVISION OF PLANNING
DIVISION OF DATA SYSTEMS
DIVISION OF FINANCE AND ADMINISTRATION
DIVISION OF INTERGOVERNMENTAL ADMINISTRATION
DIVISION OF WASTE MANAGEMENT AND ENGINEERING
DIVISION OF SURVEILLANCE
DIVISION OF AUTHORIZATION AND COMPLIANCE

FIGURE 3

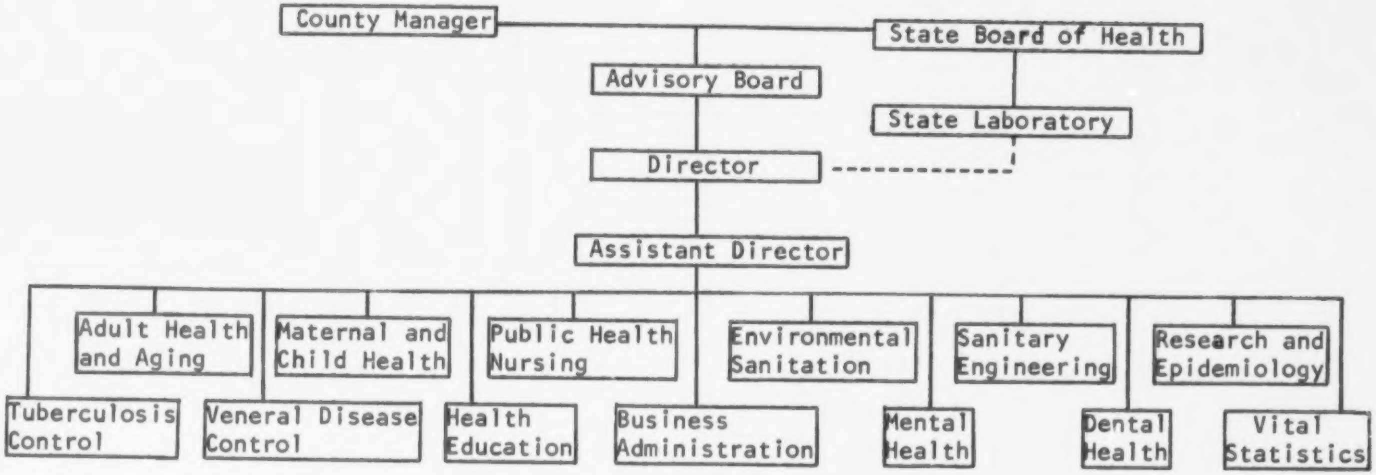
SAMPLE PUBLIC WORKS DEPARTMENT ORGANIZATION


Department of Public Works
Director
Bureau of Engineering
Bureau of Equipment
Traffic Division
Water Division
Refuse Division
Sewage Division
Street Division
Building Division

Source: ICMA, Municipal Public Works Administration, 1957, p. 11.

FIGURE 4

Dade County (Fla.) Health Organization


County Manager
State Board of Health
Advisory Board
State Laboratory
Director
Assistant Director
Adult Health and Aging
Maternal and Child Health
Public Health Nursing
Environmental Sanitation
Sanitary Engineering
Research and Epidemiology
Tuberculosis Control
Venereal Disease Control
Health Education
Business Administration
Mental Health
Dental Health
Vital Statistics

Source: ICMA, Community Health Services 1968, p. 230.

Currently, environmental activities remain fragmented between several agencies at the local level. Fragmentation occurs within municipal governments, as well as between municipal governments and other local jurisdictions, e.g., counties and regional bodies. However, just as previously seen at the federal and state level, many local governments are experimenting with new organizational units in an attempt to deal more effectively with environmental problems.

There are basically five organizational approaches utilized by local governments to consolidate environmental programs within the municipal government. These include creating a separate "line" agency, creating a separate "staff" agency, expanding an existing "line" agency, expanding an existing "staff" agency, and developing some type of "team" management. These distinctions are useful for the following discussion, although they often become somewhat nebulous when describing actual situations. The approach selected by a particular locality depends upon state enabling legislation and/or local charter, the size of the entire organization, nature and extent of environmental problems, political interest, staff expertise, and a number of other factors.

Perhaps the best example of the separate "line" agency, or one with direct operational responsibility, is New York City's Environmental Protection Administration. Created in March of 1968, this "superagency" contains bureaus for air, water and sanitation as well as a central staff. In addition to pollution control activities, New York City's EPA provides the basic municipal services such as water and refuse collections. The budget of the agency in 19[illegible]74 is nearly $500 million for operating expenditures and approximately the same amount for capital expenditures. Agency staff exceeds 21,000 employees, including 10,000 sanitation workers. Speaking at the Conference, First Deputy Administrator of the City of New York's EPA, Paul Zimmerman described the strengths of the agency as staff expertise and ability to see beyond the tremendous every day problems and maintain a broad environmental perspective. He identified the key components to a successful program in New York City to be support from top management, extensive citizen involvement and education, and effective legislation.

Zimmerman indicated that the agency had experienced some internal conflict, for example, over a proposal to construct the largest incinerator in the world, as well as with other municipal agencies, e.g., Department of Transportation and the Planning Commission. In response to a question probing the status of the EPA in relation to other departments, Zimmerman explained that EPA was of equal status to the other departments. Their role is seen to be environmental advocate. It is the role of the Mayor and Board of Estimate to set the priorities and resolve policy conflicts between agencies.

Additional examples of the "little EPA's" can be found in Chicago, Illinois; Washington, D. C.; and Huntington, New York. Simi Valley, California created an Environmental Services Department which includes traditional environmental services such as inspection, operations, water supply and the like, but not pollution control activities per se.

A second organizational alternative is to establish a separate staff agency. In many cases this may comprise from one to several staff members assigned in the office of the chief executives officer to be responsible for environmental programs. The role of this staff person or agency usually involves research, program planning and development, program coordination, policy advice, public relations and liaison with other governmental jurisdictions. Examples of this type of organization can be found in Palo Alto, California, which established an Environmental Planning Office. Montgomery County, Maryland and Waco, Texas have also established separate environmental planning units. University City, Missouri and Manhattan Beach, California have Environmental Control Officers in the Office of the City Manager. In addition, Fairfax County, Virginia and San Jose, California have created the position of Environmental Coordinator.

A third type of organizational change adopted by local governments to increase the effectiveness of environmental programs is the expansion of an existing line department to include responsibility for environmental programs. For example, the City of Addison, Illinois has staffed a Pollution Control Officer position in the Engineering Department. His function is to enforce environmental ordinances and review all pollution control equipment in the city.

Fourth, local governments may expand the responsibilities of a staff agency to include environmental considerations. Perhaps one of the most popular alternatives at this time is to add an environmental section to the planning staff. Richard Gray, City Manager of Norman, Oklahoma explained that environmental concerns are a part of every city program, and, therefore, the key to coordinating environmental concerns among all city departments rests in the planning function. For that reason, the City of Norman hired an environmental planner in the Planning Department to serve as executive secretary to the City's Environmental Control Board, a citizen advisory body, and to provide direct input into the planning process. Gray recommended that in small cities that cannot afford a large environmental staff, hiring an environmental planner may be the most realistic alternative.

Other larger cities have adopted this approach also. Inglewood, California has a three-person environmental control section within the planning department. City Manager Douglas Ayres explained that this will help bring environmental concerns into the city's decision making process. In addition, Phoenix, Arizona recently appointed an environmental planner to the planning department staff. Finally, Dallas, Texas has an environmental planning section located in the Planning Department's Urban Design Division.

A fifth method of organizing for environmental management is the "team" approach. According to Mayor Beverly Briley, rather than establish another agency, the Metropolitan Government of Nashville-Davidson County formed a management team consisting of an assistant to the mayor, an associate professor in the Graduate School of Management of Vanderbilt University, and the Chairman of the Special Environmental Committee of the Nashville Area Chamber of Commerce. The key working unit of the program is an environmental management task force, an interdepartmental team consisting of five department heads of the Metropolitan Government, including the Executive Director of the Planning Commission, Director of Planning, Director of Health, Director of Public Works, and Director of Law. The "team" has a three person, full time staff. The tasks of the "team" are to identify, research, prepare and implement solutions to community environmental problems and to coordinate Metro environmental activities. A more complete explanation of this program by Dick Battle, Project Historian, is presented with the selected readings later in this chapter.

The City of Ann Arbor, Michigan has set up a similar Administrative Environmental Committee, consisting of key department heads, to oversee city operations that involve environmental considerations and set environmental standards.

In the final analysis, City Manager Gray stated, "it is most important that the city council as well as the city administration evidence a strong commitment to generate both environmental questions and answers. They must spread an awareness and concern for the environment throughout the entire city government structure. There should be commitment and participation by all departments of the city and all boards and commissions. It is most important that the chief administrative officer, through his attitude, help meld the various boards, committees and city council into an integrated and committed whole. The manager's and mayor's philosophy and interest will to a great extent determine how successfully these groups work..."

One final alternative exists for local governments to deal with environmental problems that extend beyond municipal boundaries -- a regional organization. There are a variety of organizational structures available for regional environmental management. These include but are not limited to intergovernmental service agreements, regional planning commissions, councils of governments, special districts, metropolitan councils, metropolitan county and metropolitan federations. In his paper "Regional Environmental Management and the Decision Making Process," appearing later in this chapter, Edwin Coate summarized some of the weaknesses in current regional organizations and highlights the key components that a regional environmental management system should contain.

Additional discussion of these alternatives and the future role of regionalism in the federal system can be found in Chapter 6, Intergovernmental Relations and Environmental Management.

EMERGING TRENDS

Since 1970, there has been definite movement in federal, state, and local governments toward reorganizing environmental management by consolidating environmental activities. In most cases this is probably not a result of adding completely new environmental activities so much as the desire for greater environmental visibility, advocacy and coordination.

It seems likely that this trend will persist for at least the next five to ten years for two reasons. First, institutional changes usually lag behind the conditions that give rise to the changes. These conditions, chiefly public concern over environmental matters, continue to maintain their relevance; and, therefore, additional organizational changes are likely to continue. Second, federal environmental requirements for state and local governments that encourage institutional change have increased, and no doubt will continue to increase. For example, as requirements for environmental impact assessment expand to cover more activities (from only federally financed projects to all actions that may impact on air quality), more state and local governments will find it advantageous to officially incorporate the process within their organizational structures. Also, the reassertion of states into land use decision making plus imminent insertion of the federal government will result in significant organizational changes. Finally, the implementation of Section 208 of the Water Pollution Control Act Amendments of 1972 calling for areawide water planning and management could have a tremendous impact on the shape of future regional organizations.

It is difficult to predict the precise organizational forms that will emerge in the future because the field of environmental management is changing so rapidly. Furthermore, it is difficult to generalize since organizational structures are responsive to the particular needs of their jurisdictions. Finally, the absence of any meaningful evaluation of the alternative organizational approaches for environmental management means that there is little overall direction or guidance for state and local governments as they consider making changes.

THE POSITIVE ROLE OF ENVIRONMENTAL MANAGEMENT

Lynton K. Caldwell*

The year 1970 marked the beginning of environmental management as a distinct and identified function of government in the United States. On January 1, 1970, President Nixon signed into law the National Environmental Policy Act; and, on July 9, sent to Congress Reorganization Plan No. 3 of 1970 creating the Environmental Protection Agency. The National Environmental Policy Act made explicit the responsibility of the Federal government for the quality of the national environment. It did this in language, and with institutional arrangements and procedures, that made its declaration of policy operational. The Environmental Protection Agency consolidated ten Federal pollution control programs into a single organization based upon the perception of the environment "as a single interrelated system".

In defining the roles and relationships of these two innovations in environmental management, the President declared that the Council on Environmental Quality, created by NEPA, "...focuses on what our broad policies in the environmental field should be; the EPA would focus on setting and enforcing pollution control standards." Both measures, the NEPA and the EPA, were outcomes of a public awareness and concern for the state of the human environment that, during the 1960's, grew with a speed and scope utterly unexpected by most of the nation's leadership in public, economic, and academic affairs. It should not be surprising, therefore, that some measure of uncertainty and confusion has characterized the practical application of environmental policy and law.

This confusion over the nature of the environmental management task may be traced, in part, to the persistence of traditional ways of thinking about the functions of government and about man's relationship to his surroundings. To a large number of Americans and their public representatives, environmental policy meant pollution control. Rachel Carson's Silent Spring, published in 1962, may be described as the Uncle Tom's Cabin of the environmental protection movement. It was an attack upon pollution through pesticides, and it reinforced efforts of longer standing to obtain effective action to cleanse the nation's air and water.

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*Presented by Lynton K. Caldwell, Arthur F. Bentley Professor of Political Science and Professor of Public and Environmental Affairs, Indiana University, at the National Conference on Managing the Environment.

The remedies for pollution largely fell within the traditional scope of American government. They were the conventional processes of regulation and prohibition, with historical roots in the public health movement. Although anti-pollution legislation affected economic practices and assumptions, it was generally consistent with traditional relationships between government and the enterprise economy. This interpretation of environmental policy implied an essentially policing role for public officials--it was the negative role of environmental management. Its intended outcomes were foreseen as "positive", in the sense that an improved quality of the environment was the anticipated result.

From the viewpoint of the so-called polluter (public or private), the effect of environmental protection legislation was largely that of an economic burden. In some cases, changes in technology and production methods were required to satisfy new standards of environmental amenity. But only in relatively few instances did environmental policy appear to require a radical change in the relationship between the public and private sectors of American society or among the several levels of government. Nevertheless some observers, chiefly unfriendly, of the environmental quality movement saw it as inherently threatening to the enterprise economy and to customary personal freedoms. Characteristically, these critics were from the far "right" of the political spectrum. The curious coincidence of the celebration of Earth Day in 1970 with the centenary of the birth of Lenin convinced the suspicious that "environmentalism" was indeed a cover for creeping Marxism. But conversely, the extreme left saw environmental quality as a diversionist bourgeois tactic to distract public attention from more urgent issues of war, racism, poverty, and injustice.

The environmental movement was thus variously interpreted by its friends and its opponents, and most interpretations were oversimplifications of the actual state of affairs. Nevertheless, the environmental issue had been clearly and dramatically stated for the American people. But, as so often happens in public affairs, the symbolism of political rhetoric was accepted as a substitute for action. In addressing the Congress on February 8, 1965, President Lyndon B. Johnson spoke with force and eloquence of the threats to the quality of life posed by the darker side of modern technology, by uncontrolled waste, by urban sprawl and blight, and by the misuse of the nation's natural assets. He then spoke of the "new conservation" in language that defines both the negative and positive roles of environmental management.

He said that:

> To deal with these new problems will require a new conservation. We must not only protect the countryside and save it from destruction, we must

> restore what has been destroyed and salvage the beauty and charm of our cities. Our conservation must be not just the classic conservation of protection and development, but a creative conservation of restoration and innovation. Its concern is not with nature alone, but with the total relation between man and the world around him. Its object is not just man's welfare, but the dignity of man's spirit.

But neither President Johnson nor the Congress was prepared to act upon this noble statement. To have acted would have required a commitment of money and manpower that the nation was not prepared to make. More importantly, it would have required a readiness to consider fundamental changes in laws and attitudes toward the ownership and use of property, toward economic development, and toward the functions and jurisdictional relationships of governmental agencies. President Johnson's Address ran well ahead of his own intentions. And it is still ahead of ours--if the present policies and programs of the Federal government represent the true readiness of the American people to turn seriously to the positive task of shaping their environmental future.

This reluctance of the Americans and their public representatives to effectively confront the environmental issue does not imply a disregard of significant accomplishments at all levels of government. But most of this has been negative accomplishment in the sense that measures have been taken to retard environmental deterioration--to keep conditions from becoming worse. We have saved some wilderness from the chain saw, some scenic rivers from dams and draglines. We have a few positive victories, such as the restoration of Lake Washington and the renewal of all too small fractions of some of our cities. Yet these are hardly more than tokens, even though they may be significant and valuable tokens, of the true dimensions of the positive role of environmental management.

The states generally have been slow to accept responsibility for environmental quality beyond the mandates of Federal law. Yet some of them have gone far beyond Federal action in innovative legislation and administration. States as different as California, Hawaii, and Vermont have addressed certain of their particular environmental problems with a boldness lacking in most States.

The cities have been severely constrained in coping with their major environmental problems. Their present circumstances, with few exceptions, are profoundly discouraging. To "...restore what has been destroyed and salvage the beauty and charm of our cities..." will require solutions to social and political problems that we have not yet realistically faced, and will require the marshalling of money and talent on a scale only obtainable heretofore under the duress of war. Ultimately, we will make the necessary effort, not because we want to, but because we must. How soon we will confront necessity cannot be foreseen. We will not do so until the bankruptcy of our present approaches toward coping with our socioecological problems becomes unmistakably evident.

Historically, public realization that its institutions and leadership have failed to meet the challenge of its problems has often led to disastrous consequences. Unfortunately, the tempo and complexity of modern society could result in sudden and drastic events that could lead to a collapse of public confidence and in resort to ad hoc and expedient panaceas. Bad conditions could be made worse. Recognition of this danger has stimulated a variety of efforts and proposals to anticipate future consequences of present trends. The growth of "futurology", the call for a national Council of Urgent Studies, and the Club of Rome's inquiry into the predicament of mankind are evidence of this apprehension. In all of these conjectural approaches to the future, the relationship between man and his environment--natural and artificial--is a major factor. The full scope of what John Platt describes as a coming crisis of crises extends beyond the limits of our immediate concern. But we may consider one positive step that could be taken now to prepare us to act purposefully and constructively when we face the opportunity and necessity for taking in hand the shaping of our environmental future.

The action that I propose is the logical and necessary step to implement Lyndon Johnson's "...creative conservation of restoration and innovation", and to realize the objectives set forth in the National Environmental Policy Act and endorsed in principle by President Nixon and the Council on Environmental Quality and by prominent members of both major parties in the Congress. As one step toward more firmly grasping control over the conditions of our national existence, I propose establishment by the Congress of the Environmental Reconstruction Agency.

Consideration of the functions and structure of this agency should begin now, even though in advance of a willingness of the Congress and the President to establish it by law. The organization of the Agency should be thought through, and its tasks and costs analyzed while there is time for rational consideration of options and alternatives. Our traditional American way is to meet foreseeable, but unforeseen, emergencies with improvised responses, with "crash" programs, and frequent miscarriage of hopes and opportunities. There are risks in the planning that this proposal implies, but are these risks greater than those of ad hoc responses by an unprepared government and people under stress?

The E.R.A. would neither supersede nor resemble the EPA. Its most effective form of organization would be one of the problems to be worked out. But it seems very unlikely that it would be a consolidated bureaucratic structure. More likely it would be a coherent system or network for marshalling and deploying resources of knowledge, manpower, and money and, most importantly, for assisting people throughout the country to identify and analyze their environmental options within the full range of human values. It would provide a capability for focusing national attention on large and critical environmental problem areas that have thus far remained beyond the reach of our public institutions. Among the more apparent of these areas are the Southern Appalachians, the Great Lakes, impoverished areas of the arid Southwest and, above all, the tragic wasteland areas of urban America.

Among the specific tasks toward which the machinery of the E.R.A. would be directed would be the restoration of derelict land and degraded landscapes, the renewal and rebuilding of deteriorated urban and suburban areas, the removal of misplaced and decayed structures across the countryside, and the selective and democratically-controlled regrouping of smaller settlements to form communities of political, economic, and cultural viability.

The means of action might include a revival of the former Civilian Conservation Corps' idea as an Environmental Conservation Corps, but open to both sexes and to part-time as well as full-time service. The conventional instruments of loans, contracts, grants, technical services, and pilot projects would almost certainly be utilized.

A major resource would be the Corps of Engineers. The tasks of environmental reconstruction offer the kind of challenge for which the capabilities of the Corps are especially well-adapted. The Corps of Engineers is much too valuable a national asset to waste on the kind of economically specious and environmentally damaging public works that the Congress has too often thrust upon it. There is no obvious answer to how the Corps might most effectively be related to the E.R.A. It would not necessarily have to become an integral part of it to perform its technical and managerial functions in accordance with a comprehensive plan coordinated through the E.R.A.

Similarly the Bureau of Reclamation, now overdue for liquidation, might provide valuable scientific and technical resources for the new agency.

In 1968, at a Symposium on Human Ecology sponsored by the Public Health Service I stated that: "Although Americans may not be prepared to make the effort, a 'Manhattan Project' for human ecology is as greatly needed now as any military preparation ever was." I believe today that the magnitude and the importance of the task of environmental reconstruction is of the same order of priority as national security and is, in a very real sense, a function of national security. The "Manhattan Project" suggests the magnitude and focus of the reconstruction effort, but not its structure nor its method of operation.

What order of funding would an Environmental Reconstruction Agency require to implement the positive role of environmental management? During its initial operative stage, but beyond its formative period, an annual budget of $10 billion might be sufficient, provided that it was administered in such a way as to generate an additional $10 to $15 billion from state, local, and nongovernmental sources. Not all E.R.A. funds would necessarily need to come from new Federal revenues. Transfers from existing programs of diminishing priority could account for a significant portion of the total.

Here then is a positive approach to the role of environmental management. To make the effort effective, a national land-use planning act would be an essential concomitant. Land-use planning legislation is now before the Congress, and enactment of an adequate bill could be a significant step toward giving the American people a means essential to the shaping of their future environments. How will our future be shaped? By accident, inadvertance, uni-dimensional policies, and *ad hoc* expediency; or will we risk the human errors inherent in rational planning and foresight and make the hard choices of responsible stewardship for our future? These are the polarities of our choices.

STATE GOVERNMENTS TACKLE POLLUTION

Elizabeth H. Haskell*

By revising present departments or creating new ones, a number of states are taking significant steps for environmental protection.

The explosion of interest in the environment which began in the late Sixties is bringing wide-ranging reform to the environmental institutions of state government. A number of states have taken initiatives and are beginning to carve out a new strategic place for themselves in environmental protection. States are closer to many pollution and natural resource problems than the federal government and so are able to structure their attack in a more tailor-made fashion. With this more detailed perspective, states are moving to take over some actual planning, construction, and management tasks. In the process of assuming more control over land use and treatment of wastes, some traditionally local environmental functions are now shifting in part to the states.

While the federal government is moving toward national pollution control standards, the new consolidated state environmental agencies, with their increased emphasis on pollution regulation, may have a stronger role in the daily implementation of standards, through permit processes, surveillance, and enforcement actions. This subtle shift of roles among federal, state, and local governments may be molding a new partnership for public action to protect the environment.

As states have sought to assume new environmental responsibilities, they have often sought to make their governmental organizations match problems and ensure that each has adequate legal authority. To do so, some states have created new government agencies to administer new state programs. Others have reorganized existing executive agencies or assigned a new role to the judicial institutions of government.

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CONSOLIDATED DEPARTMENTS

Illinois, Minnesota, Washington, Wisconsin, and New York provide variations on the theme of state program reorganization, designed to achieve a comprehensive approach to environmental problems. Other states, such as Vermont, New Jersey, Delaware, Pennsylvania, Arkansas, Oregon, Massachusetts, and California also have set up such new environmental departments, and still others are considering such action.

Pollution control is the main focus of the new environmental agencies -- all except Wisconsin where traditional conservation programs predominate -- with a functional emphasis on regulatory work. It was hoped that pulling together common responsibilities for standards-setting, permits, monitoring, and enforcement in one agency would reinforce control strategies and make them stronger and more systematic, avoiding conflicting requirements for industries, municipalities, and other polluters.

Illinois's reorganization is unique. The Illinois Environmental Protection Act of 1970 created three new environmental agencies in 1970. Each is concerned with air, water, land, and noise pollution and public water supplies, but each organization has a different functional focus. The five-member Illinois Pollution Control Board replaces the two former boards for air and water pollution, but unlike the previous boards, it works full time and has staff, funds, and the major policy powers of the state. The Illinois board, one of the most powerful in the country, sets standards, hears appeals from agency decisions, and adjudicates enforcement proceedings. The Illinois Environmental Protection Agency was created by shifting the antipollution officials out of the health department and into a new, separate agency. It identifies and prosecutes polluters, issues permits, and extends technical and financial aid. A third, completely new organization, the Institute for Environmental Quality, conducts long-range pollution control and land use planning and research for all agencies of the state.

By contrast, in Minnesota, Washington, Wisconsin, and New York, environmental programs were consolidated into one new full-time department which performs all daily program functions. Minnesota's Pollution Control Agency was created in 1967 by shifting the water pollution control program out of the health department and adding newly enacted air pollution and solid waste responsibilities. In 1970, Washington created the new Department of Ecology, combining these same three forms of pollution control, but went one step further and consolidated the program to regulate the withdrawal and use of water. Both Wisconsin in 1967 and New York in 1970 created environmental "super-departments," combining in one new department all pollution controls from the health departments, with their former Conservation Department's resource management activities for fish, wildlife, water, forests, and recreation (Figure 1).

In these last four states, the environmental department is overseen or directed by an interagency or citizen board, which serves part-time in

Figure 1. STATE ENVIRONMENTAL AGENCIES

	Institution Examined	Estimated Budget FY 1971[a]	Staff Size	Principal Official	Policy Formation by	Water Pollution	Air Pollution	Solid Wastes	Nuclear Radiation	Pesticides	Noise	Oil Pollution	Municipal Water Supply	Water Use Management	Minerals	Fish	Wildlife	Forests	Parks	Land Use Planning	Land Use Control
ILLINOIS	Pollution Control Board	$ 40,000	18	David Currie, chairman		●	●	●	●	●	●		●								●
	Environmental Protection Agency	6,500,000	366	William Blaser, director	Board	●	●	●			●	●	●								
	Institute for Environmental Quality	2,000,000	9	Michael Schneiderman		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
	Total	$ 8,540,000	393																		
MINNESOTA	Pollution Control Agency	$ 1,185,000	75	John Badalich, director	Board	●	●	●	●	●			●							●	●
WASHINGTON	Department of Ecology	$ 6,281,774	254	John A. Biggs, director	Director	●	●	●						●							●
WISCONSIN	Department of Natural Resources	$43,134,000	1,886	Lester Voigt, secretary	Board	●	●	●		●			●	●		●	●	●	●		●
NEW YORK	Department of Environmental Conservation	$40,000,000	2,748	Henry Diamond, commissioner	Director	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
VERMONT	Environmental Board (In Agency of Environmental Conservation)	$ 100,000	2	Benjamin Partridge, chairman	Board															●	●
MAINE	Environmental Improvement Commission	$ 85,000 (for land use) of $ 1,000,000 (total)	2	J. Donaldson Koons, chairman	Board	●	●														●
MARYLAND	Environmental Service (In Department of Natural Resources)	$ 413,000	27	Thomas D. McKewen, director	Director	●		●													

[a] Includes federal program grants, and state general revenues, but does not include federal funds for municipal waste treatment plants, nor state grants for the same purpose.

contrast to Illinois' "professionalized," full-time board. In Minnesota and Wisconsin, the boards perform in the same traditional manner, meeting part-time and setting all policy, while in Washington and New York, these part-time bodies are largely advisory (Figure 2).

A first step agreed on in each state was to shift pollution control responsibilities out of the health department to broaden antipollution concerns beyond health and to increase the state's emphasis on legal regulation. It was reasoned that a new administrative agency would be more likely to be concerned with fish and wildlife, recreation, aesthetics, and social and economic interests in pollution control without competition from unrelated health issues.

BENEFITS

In all five states, linking like programs in a new environmental agency was expected to have many benefits. At a minimum, each state combined its air, water, and solid waste pollution programs to avoid state policies that would merely trade one form of pollution for another. The physical phenomenon, that solid, liquid, and gaseous wastes interchange forms during treatment and disposal into the environment, became an unquestioned, organizational precept, compelling major antipollution programs to be housed under one administrative roof. Planning, management, and control systems, then, could be expected to more closely parallel the integrative network of nature. New York and Wisconsin officials saw further strong program linkages between pollution programs and resource management activities since both affected air, water, land, and living resources.

A mix of other benefits was seen by reorganization supporters. In Minnesota, Washington, and New York, it was further hoped that linking various programs under one director or board would create an agency "advocate" for the environment -- someone who could speak out to the public and the legislature in favor of environmental protection issues. A director of an environmental department, where his work was not encumbered by competing program missions, would be free to act as the state's spokesman for the environment. In this way, state issues were expected to be better articulated, and the public could participate more fully in state decision making.

By contrast, the Wisconsin consolidation of pollution control and conservation programs was intended to eliminate that state's advocacy system in which resource issues had been publicly debated. This process was thought to confuse and "politicize" environmental issues. A super-department might be able to settle many resource and antipollution conflicts internally in a more efficient way.

Nearly all states expected that linking several programs would build a stronger political base for environmental efforts. A new agency would be more visible to the public and be established with executive and

Figure 2. ENVIRONMENTAL BOARDS AFTER REORGANIZATION

CHARACTERISTICS:		SERVICE				APPOINTMENT			COMPOSITION (BY STATUTE)								FUNCTIONS							
State@	Members	Part-time	Full-time	Per diem	Salaried	Governor & Senate	Term (yrs)	Serve at gov's Pleasure	Interagency	Industry	Agriculture	Labor	Health	Conservation	Municipalities	Unspecified	"Public"	Policy-making	Approves dept. action	May veto dept. actions	Appoint dept. director	Operational	Quasijudicial	Advises dept.	Nature of previous boards in the pollution control area
ILLINOIS Pollution Control Board	5 employs staff also		●		●	●	3	(chairman only)								5		●					●		1 citizen, 1 citizen and interagency board
MINNESOTA Pollution Control Board	9	●		●		●	4				1				2	8		●							1 interagency board (water pollution)
WASHINGTON Ecological Commission	9	●		●		●	4			1	1	1			1	5				●				●	1 interagency, 3 interagenc. and citizen boards
WISCONSIN Natural Resources Board	7	●				●	6							4		7		●			●				1 interagency board (water pollution)
NEW YORK Environmental Board	15	●		●		●	6		9	1		4		1					●					●	3 interagency boards
VERMONT Environmental Board	9	●		●		●	4 (chairman for 2)	(chairman only)								9		●				●	●		N/A
MAINE Environmental Improvement Commission	10	●		●		●	3			2				2	2		4	●				●			N/A

@Maryland's Environmental Service does not have a board.

legislative endorsements, which would strengthen the agency's power. New York and Wisconsin officials hoped that super-departments would provide a united focus that could encourage various environmental and conservation interest groups to unite their efforts.

Finally, all program consolidations were throught to increase administrative efficiency, cutting down on overlaps and duplications to save public funds. Wisconsin's and Washington's environmental reorganizations were designed to reduce the proliferation of all state agencies and to strengthen the role of the governor in the operation of all state programs. Unlike Wisconsin, Washington did not give active consideration to including conservation programs in the transfer. These are administered in several politically powerful departments. However, Washington's history of interest in consolidating water quality and water quantity programs, plus the need for new leadership in the Department of Water Resources, led to the water use regulatory activity being combined with pollution control in the new Department of Ecology.

BOARD AND COMMISSION ROLES

In addition to reducing the influence of the health department and consolidating similar environmental programs in a new agency, a third type of change is common to each state's reorganization process -- in the composition and/or role of part-time policy boards.

Air pollution and water pollution control boards were consolidated to broaden their environmental perspective, to match that of the newly created department which they supervised. Furthermore, by reducing the proliferation of part-time boards and commissions, it was hoped to make state government more manageable and more responsive to the governor. All five states were faced with pollution control boards made up of state officials and/or private citizens -- the traditional mechanism by which state governments make pollution control and natural resources policy. The typical role for these old boards was to set all policy, leaving its day-to-day administration to the regular state agency. In the environmental field, an air pollution board or water quality commission had power to set standards, approve the pollution control agency's budget and legislative requests, refer enforcement actions to the Attorney General, and, in some instances, appoint the director of the administering state agency.

These groups came under attack as being inexpert on complicated pollution matters, at best, and, at worst, soft on polluters they were supposed to regulate. Industry, agriculture, and local government board members could, and often did, veto any aggressive state action.

Faced with these flaws, the five states adopted varying solutions. In Minnesota and Wisconsin, the interagency composition was changed to a private citizen one. Washington and, to a lesser extent, New York reduced their boards' policy role to mostly advisory. Illinois professionalized its new board, making membership a full-time job for three years and increasing its capabilities and powers.

Wisconsin and Minnesota continue to operate with old-style boards -- that is, part-time, policy-making groups which govern most significant affairs of the agency (including in Wisconsin the appointment of the Secretary of the Department of Natural Resources). Proponents of the policy boards see them as incorporating many views into decision making for environmental resources and checking any arbitrary action of a department director and the governor.

The alternative -- a strong single director for an agency appointed by, and serving at the pleasure of, a governor -- is viewed in other states as a way of increasing capabilities of state officials and programs, speeding agency response time on crises, and making state officials responsive to the state's chief executive, who, in turn, can be held accountable to the voters.

In Washington, the Ecological Commission can, in theory, veto departmental action, but in reality will probably be mostly advisory. In this state, changing the boards' policy role was a primary reorganization objective of the Republican governor, who initiated the move. However, legislative compromise produced an Ecological Commission with some veto powers and a Pollution Control Hearings Board which reviews departmental actions in a quasijudicial manner.

During the New York reorganization, which was planned and executed out of the governor's office, a new interagency and private citizen State Environmental Board was created with statutory authority to approve all pollution control standards. However, the extent of this authority is not yet clear, and the Board may very well prove to be mostly advisory. While New York and Washington now have strong director systems, their advisory boards are considered useful as a forum for diverse segments of society to articulate their views and for the state to solicit the cooperation of private citizens and other state agencies on new policies. Appointments to these bodies are also a way for governors to reward political favorites.

LAND USE CONTROL

The Vermont and Maine land use control systems are examples of many states' increasing interest in land use planning and controls to prevent environmental damage. In 1970, both Vermont and Maine established state permit systems to control large commercial, industrial, and housing developments. In Vermont, anyone, including a state agency, planning a development over one acre or a subdivison of more than ten units must first have a permit from the state. If there is a permanent local zoning, the state's permit is required for developments over ten acres, giving the localities an incentive to adopt local controls. In Maine, the state controls all developments over twenty acres or 60,000 square feet of industrial floor space.

The Vermont statute specifically requires the state to draft land use plans, based on economic, social, and, particularly, environmental values. The permits will implement these planned objectives.

The Maine law has no such specific requirement for land use planning. Permits for land development in Maine must consider four statutory criteria: financial capacity of the developer, traffic movement, effect on the natural environment, and soil conditions.

Vermont created a statewide Environmental Board that sets policy, is responsible for the land use plans, and has a quasijudicial review role over permits, and nine district commissions which administer the permit system on a daily basis. The Vermont Board is exclusively a land use agency, and is located in Vermont's super-department, the Agency of Environmental Conservation.

Maine's institutional structure is not regionalized in this way. Its Environmental Improvement Commission formulates all policy, carries out the operational jobs of reviewing and issuing permits, and also administers air and water pollution control laws. Both the Vermont and Maine systems are designed to control and mold the physical growth of the state.

WASTE MANAGEMENT AGENCY

The Maryland Environmental Service (MES) was created in 1970. It gave the state a new function which had been left exclusively to local government -- the actual construction and operation of solid and liquid waste treatment and disposal facilities. Like land use control in Vermont and Maine, another type of local function is shifting, in part, to the state level in Maryland.

MES is a public corporation, housed within the Department of Natural Resources, which acts like a statewide sanitary district, to institute a management rather than a regulatory approach to environmental quality. While the New York Environmental Facilities Corporation and the Ohio Water Development Authority have similar authority to construct and operate waste treatment and disposal facilities, only Maryland has specific authority and funds to draft and implement solid and liquid waste facilities plans, in order to institute regional approaches to waste management.

MES can assume its waste control function in several ways:

.Through implementation of the five-year regional plans for solid and liquid wastes

.Providing the desired facilities or services when a local government or industry requests aid, and

.If an industry or municipality violates a compliance order to conform to water quality standards or regulations governing solid waste disposal, MES can take over the violator's waste treatment and disposal facilities until compliance is achieved, sending the local community the bill.

In these ways, the Service becomes both a regional service institution and a weapon in the state's arsenal to gain compliance with water quality goals and solid waste disposal regulations.

As with Vermont and Maine's entrance into the land use control field, Maryland's initiation of waste treatment and disposal work does not take all such responsibilities away from local government. In fact, in all three of these situations, the state seeks a partnership arrangement with local government.

COURTS AND THE CITIZEN SUIT

Michigan is trying a fourth type of institutional approach -- assigning a new role to the state courts in environmental protection.

The Michigan Environmental Protection Act gives every public or private entity the right to sue any other public or private entity in state courts to protect the environment and the "public trust" therein. This mechanism of class action lawsuits by private citizens to forestall environmental damage is receiving consideration in many other states as well as at the federal level.

REGIONAL ENVIRONMENTAL MANAGEMENT AND THE DECISION-MAKING PROCESS

L. Edwin Coate*

The concept of "Environmental Management" has evolved over the past decade. As the concept evolved, there have been corresponding alterations in the organizations and institutions concerned with these fields. In the early 1970's, in response to a widespread and well articulated public concern, many governmental agencies reorganized to improve their environmental quality delivery capabilities. The Federal government created the Environmental Protection Agency, CEQ, and NOAA. Several states consolidated previously separate environmental functions into new Departments of Environmental Protection.

Of all the governmental levels, however, I believe that the local/regional official has done the least to reorganize and to develop new methods and techniques to manage the environment. This has been due primarily to lack of funds, lack of time, and confusion as to what needs to be done.

Yet it is the local government official who feels the greatest pressure to clean up the environment. Of the various bureaucrats, he is closest to the problems themselves: the polluted streams, the open dumps, the contaminated air. He is also in the direct line of fire of a public demanding action. Unlike federal and state officials, his responsibility is localized. He cannot evade it by moving about the country or about the state. Whatever tools that currently exist for dealing with the major environmental problems, such as capital budgets, health regulation agencies, and planning resources, are in his control. These tools have proven inadequate on many occasions.

The primary problems facing the local official today and what, in my opinion, the entire issue boils down to is: Who carries out the decision making process at the regional level, and what information does he need to make the appropriate decision? In matters of the environment, decision making must take place at the regional level. Pollution does not conform to political boundaries. Water pollution needs to be dealt with in terms of river basins; air pollution follows geographical configurations. Problems such as air and noise pollution and solid waste management are beyond the capacity of most local governments to solve without the cooperation of other jurisdictions.

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*Presented by L. Edwin Coate, Director, Integrated Regional Environmental Management (IREM) Project County of San Diego, at the National Conference on Managing the Environment.

What exactly do we mean by "regional environmental management"? In the past, we thought it consisted only of pollution regulation. Recently, however, as cost effective short-term solutions are being exhausted, we see that regional environmental management must be expanded to include the relating of pollution abatement strategies regularly and consistently to the regional land use and transportation planning process. Decision makers are the fundamental users of the environmental management process, and the heart of the local government decision making process is land use. The heart of the regional governmental decision making process has evolved to be the transportation planning process.

In the past, prior to the evolution of the contemporary concept of regional environmental management, just about the only means by which local government managed land use problems was the planning process. Councils of Governments had the A-95 review process and a comprehensive planning mandate, but no implementation policy. Land use decisions were still made at the local level and pollution problems were, as a rule, managed by the Health Department. Such functional fragmentation prevented a comprehensive attack on environmental problems.

I believe that the new "art of regional environmental management" has emerged because this process has failed. It has failed primarily because it is based on a fragmented planning approach which does not meet the needs of today's decision makers. As you are well aware, the traditional planning approach involved the setting of goals and objectives, the drawing of comprehensive maps, and the adoption of general plans, with subsequent rezonings to conform to the plans adopted. This is time consuming, but still relatively neat and uncomplicated. The problem is that in the day-to-day world of local land use planning and pollution regulation decision making, the general plan is almost always obsolete before adopted, and every case presented is an exception. An example is the "little old lady" who needs a re-zone to obtain some value from the property she has held all of her life, or, the essentially insignificant change that might be requested of a local politician by a major campaign contributor. In reality, then, I would propose that the decision making process is incremental and situational, while the local planning process is neither.

Several recent events have reinforced these conclusions. The federal government passed NEPA, the National Environmental Policy Act of 1969, which required the preparation of Environmental Impact Reports for all federal actions and projects that have a significant effect on the environment. In California, the California Environmental Quality Act (CEQA) was passed. This act, patterned after NEPA, requires EIR's on both public and private projects to be carried out or permitted by all local governmental agencies in the state.

Also in California, Proposition 20, a statewide citizens initiative, was passed, becoming the California Coastal Zone Conservation Act. This Act provided for the establishment of a series of regional commissions responsible for administering a permit system for all major actions affecting the coastal area in each region.

The EIR process and the regional coastal permit system established by Proposition 20 are clearly a result of the recognition that existing land use and health regulatory institutions have not been able to deal effectively with critical regional environmental problems. They represent attempts to make up for the deficiencies of traditional planning and environmental control strategies by substituting finite, single-purpose systems which are capable of actually implementing a policy. The land use planning process in particular has simply not been able to provide decision makers with timely, accurate, comprehensive information on which they can base their day-to-day incremental decisions.

It is my feeling that new structures similar to the regional environmental management model shown here (see Figure 1) will be developed, using the EIR process, specialized permit systems, and other new regional environmental management tools.

What other kinds of information are necessary inputs into the environmental decision making process? I would propose that an environmental decision making model might include: cost/revenue information, environmental impact information, environmental indices trend information, and carrying capacity information, as well as traditional land use planning inputs (a model incorporating these inputs is depicted in Figure 2).

COST/REVENUE INPUTS

Land use decision making bodies in a region now usually consider two principal factors in arriving at approval or disapproval actions, the environmental impact and the economic impact of the project. Unless there is reliable economic impact information available, the environmental impact cannot properly be treated except in those situations in which there is the most severe type of environmental insult. The public costs and revenues associated with a project are felt to be the minimum economic information required.

The San Diego joint city/county economic analysis project has resulted in a computer model now being tested on four major local developments. To date, the cost and revenue calculations have been directed toward those jurisdictions (cities, county, special

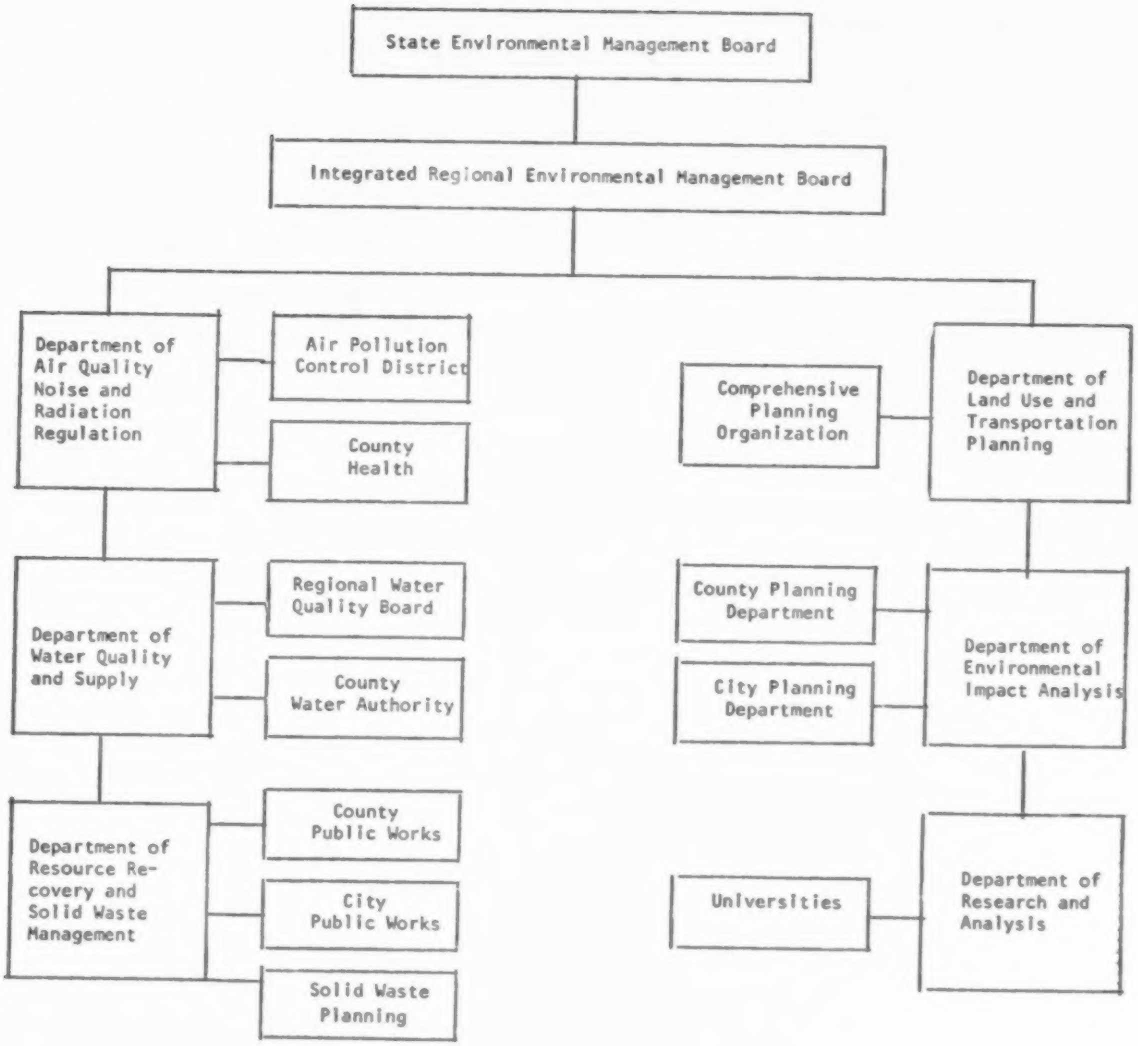
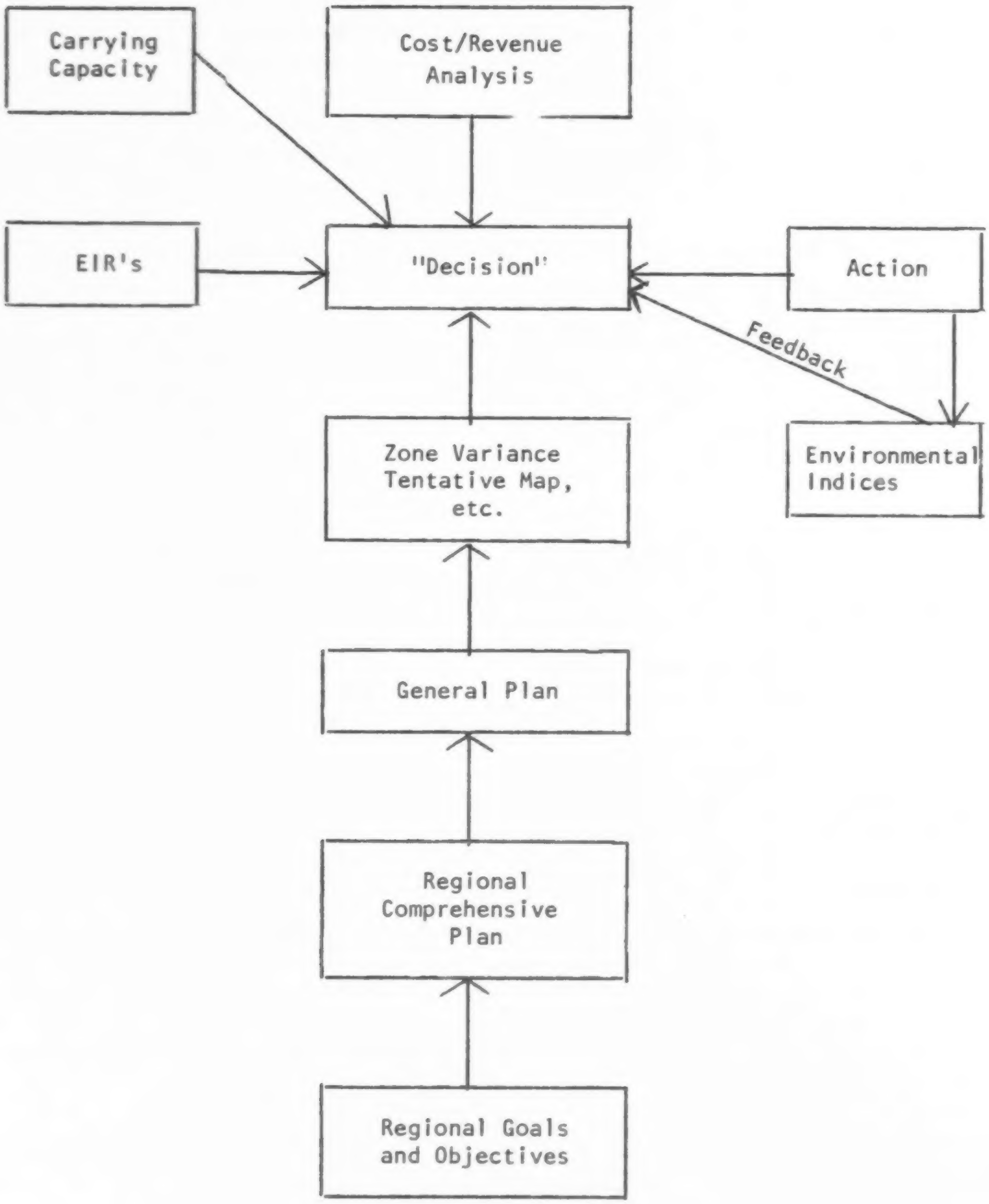

State Environmental Management Board
Integrated Regional Environmental Management Board
Department of Air Quality Noise and Radiation Regulation
Air Pollution Control District
County Health
Department of Water Quality and Supply
Regional Water Quality Board
County Water Authority
Department of Resource Recovery and Solid Waste Management
County Public Works
City Public Works
Solid Waste Planning
Comprehensive Planning Organization
Department of Land Use and Transportation Planning
County Planning Department
City Planning Department
Department of Environmental Impact Analysis
Universities
Department of Research and Analysis

Figure 1. Application of Environmental Management Model to the San Diego Region

Figure 2.

ENVIRONMENTAL MANAGEMENT AND THE DECISION-MAKING PROCESS


Carrying Capacity
Cost/Revenue Analysis
EIR's
"Decision"
Action
Feedback
Environmental Indices
Zone Variance Tentative Map, etc.
General Plan
Regional Comprehensive Plan
Regional Goals and Objectives

districts, etc.) which are directly affected by the proposed development, that is, those jurisdictions in which the development is "physically" located. In the future, it is clear that consideration must be given to jurisdictions which are indirectly but substantively affected because of employment, transportation, recreational facilities, etc.; thus a substantial amount of additional research will be required on this matter.

We anticipate that within one year, a cost/revenue analysis procedure with acceptable accuracy can be developed to the point where it may be applied routinely to the land use decision-making process in San Diego county.

ENVIRONMENTAL IMPACT REPORTS (EIR's)

The second major factor in land use decision-making is the determination of the environmental impact of a project. San Diego County has had a policy and procedure for EIR's since April, 1972. Since the Friends of Mammoth decision, EIR's are required on both public and private developments. The development of the EIR process by the IREM project has been an arduous and complicated task. We believe, though, that we now have a completely operational system which can provide timely, accurate information to our decision makers on the potential environmental effects of any proposed project. The most innovative components of the San Diego County EIR process include an early warning system and an environmental review board.

Early Warning System: The IREM project staff has developed a computerized early warning system for predicting environmental impacts. For any given geographical site in the region, information concerning natural resources and conditions on and near that site can be immediately retrieved and printed out by a computer.

An Environmental Review Board: The Environmental Review Board oversees the preparation of environmental impact reports and coordinates the public review process. The environmental review board consists of the IREM project director, the County Planning Director, the County Engineer and the Director of the Public Health Department. This Board formally coordinates the input from those agencies that deal substantively with these projects. A staff of sixteen supports the Environmental Review Board.

ENVIRONMENTAL QUALITY INDICES

Prediction and feedback are essential to any decision making model constructed. In San Diego County, the IREM project has recently developed environmental quality indices for air and water quality, noise, energy production and use, solid waste generation and land use shift.

For the decision makers, these indices will provide important trend information for both pollutants and land use. The will also serve as a feedback showing changes in trends which result from various land use decisions.

CARRYING CAPACITY

As rational environmental managers, we are concerned with the limitation of our "resources." We must be able to predict the "carrying capacity" of the air, water, land and energy resources of our region to know how much growth, and how much pollution, our region can hold.

Data now exists in San Diego to predict the growth limits of the physical restraints already listed above. What is lacking is merely the assimilation and analysis of this data and its transformation into forms usable by decision makers. This is now under way in San Diego.

TRADITIONAL PLANNING PROCESS

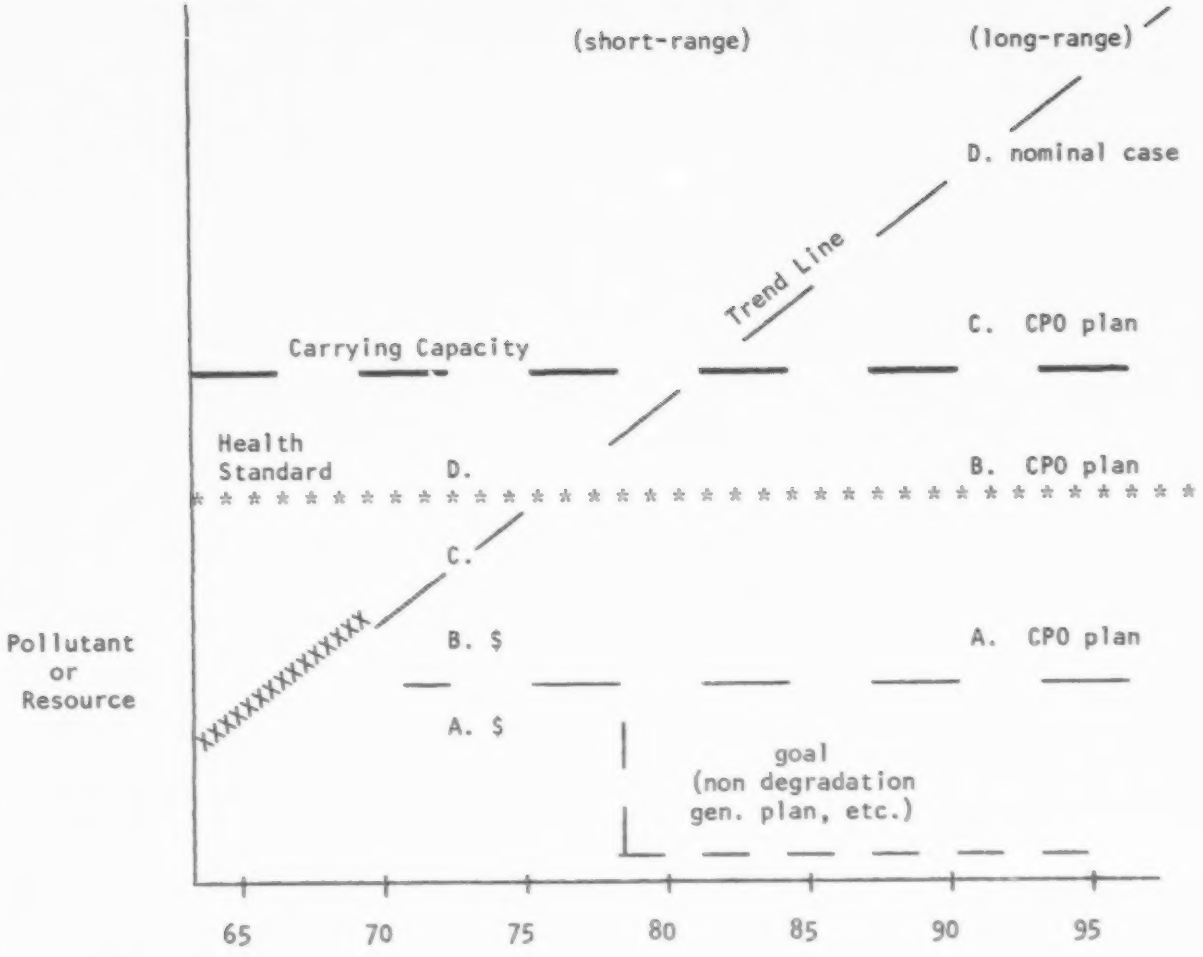
Through the traditional planning process, information on regional goals and objectives can be transmitted to decision makers. Regional goals and objectives are transmuted into a regional plan, the implementation of which is carried out through the zoning process.

NEW TECHNIQUES FOR COMMUNICATION

Once the inputs described have been developed to a point where they can regularly support the decision making process as depicted in the model, the final question is: What is the most effective technique for communicating the information to the decision makers? The technique chosen should be able to show information in a clearly comparative form. The ideal index diagram shown in Figure 3 is a proposed format for regional environmental management inputs to both short- and long-range decisions. It is anticipated that for each major decision, a series of these diagrams, depicting relevant information in the categories previously described, would be presented to decision makers. These diagrams can depict the proposed action in context with existing trends, its relationship to prescribed environmental standards, the extent of divergence from community or regional plans, and its feasibility, given the carrying capacity of the region. Further work is currently being conducted in San Diego on the development of this information display technique.

Figure 3.

THE IDEAL INDEX DIAGRAM


(short-range)
(long-range)
D. nominal case
Trend Line
C. CPO plan
Carrying Capacity
Health Standard
D.
B. CPO plan
C.
Pollutant or Resource
B. $
A. CPO plan
A. $
goal (non degradation gen. plan, etc.)
65
70
75
80
85
90
95

time

FUTURE NEEDS

There is one additional input which must ultimately be included in the model. This is the quantification and presentation of social impact information. Eventually, this requirement may be met by the inclusion of social impact data in Environmental Impact Reports or by separate "Social Impact Reports" similar to EIR's. Perhaps the optimal situation in the future would be an overall requirement that each major land use decision be accompanied by the Quality Of Life Impact Report. The Quality Of Life Report would include current, comparative information of environmental, economic and social impacts related to specific aspects of the planning process.

A DESCRIPTION OF THE ENVIRONMENTAL PLANNING & MANAGEMENT PROJECT

Dick Battle*

Prior to the establishment of Metropolitan Government in 1963, Davidson County, Tennessee, included a multiplicity of municipal units including a major city government, several smaller "satellite" cities, a county government, sixteen civil districts and eighty-seven administrative boards and agencies.

The advent of Metropolitan Government, April 1, 1963 with Mayor Briley elected mayor of the new governmental structure, produced a centralized local government with seventeen major administrative boards, a legislature of forty-one council members and service delivery systems and facilities designed around two service districts:

1. The Urban Service District confined to the area of relatively high population density and bounded by the former limits of the City of Nashville as extended by the annexations of 1961-62.
2. The General Services District which is county-wide and included the total 533 square miles of the county area.

The functions which control environmental quality include: transportation and land use planning, sewage and surface water drainage, solid waste collection and disposal, health and code enforcement, zoning, water supply, and law. Since all of these functions are administered under Metropolitan Government on a county-wide basis, an opportunity is afforded for the coordination of appropriate department heads into a management team capable of participative planning and the implementation of joint problem solving.

Like many of our nation's urban areas, Metropolitan Nashville is faced with many environmental problems. These include the problems of 1,200 daily tons of solid waste and the absence of adequate sanitary landfills for its disposal, untreated industrial wastes overloading sewage treatment facilities and wet-weather overflows from the "combined" sewers of the central city, and air pollution.

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*Dick Battle is Historian, Environmental Planning and Management Project, Metropolitan Government of Nashville and Davidson County, Tennessee. This article was adapted from a paper prepared for publication in the Vanderbilt Alumnus Magazine.

Motor vehicle emissions have replaced coal smoke as the top-ranking air pollutant, but the need for a modern, enforceable -- and enforced -- air resources management program remains a high priority for the city and its environs.

On July 13, 1972 Metropolitan Nashville received a private grant to develop a more efficient structure for management of the environment within the Metropolitan Government. Specifically, the Environment Planning and Management Project (EPMP) was intended to develop a comprehensive regional waste management system including the related problems of air and water pollution, transportation and land-use planning; and to establish an environmental management team in local government.

The main objectives of the project are the following: (1) to define, analyze and describe the problems which preclude efficient environmental management; (2) to determine priorities for the consideration of environmental problems, to establish both short-range and long-range objectives, and to initiate training for environmental management "teams," and (3) to utilize the "teams" for the development of skills and management techniques within the existing local governmental structure for continuous achievement after the project is terminated.

The project is organized around a three-member core group representing Metropolitan Government, the Vanderbilt Graduate School of Management, and the Chamber of Commerce. The three-member top management team for the project are representative of the "partnership" arrangement which is one of the strengths of the program: Horton, a representative of the local government and the mayor; Chairman of the Nashville Area Chamber of Commerce Environmental Committee, representing the business, professional and industrial community; and a professor from the University representing the academic community.

The management team includes as permanent members five individuals in high-level positions in the major environmental agencies of the Metropolitan Government: The Metropolitan Planning Commission (two representatives), Department of Health, Department of Public Works, and Department of Law.

As it is designed and implemented, the EPMP coordinates the concern, the ideas and the capabilities of local government, business, industry, finance, and concerned citizens, the university and academic community and agencies of both state and federal government plus the regional planning capabilities of the Mid-Cumberland Council of Governments. An additional interface group is the Urban Observatory of Metropolitan Nashville-University Centers.

The project began with a meeting of the "Business Task Force Environmental Ad Hoc Committee" of the Nashville Area Chamber of Commerce. The session ended with unanimous approval that the "packing house industry problem be recommended as the first project for joint action." The EPMP assigned a task force to "study the wastewater problems of the meat packing industry in Nashville." The team began its work in late July and it has continued with substantial success through this year.

The basis of this problem turned on the fact that meat packing plants in Nashville have, in the past years, utilized from one-half to three-fourths of the population equivalent of the capacity of the North Nashville sewage treatment plant. The wastewater sewered from the plants contained suspended solids, grease and other components in excess of limits specified in the amended Metropolitan Wastewater Ordinance. Complicating the problem, the companies in the "meat products" category in Nashville and Davidson County have a total direct employment of more than 1,500 with an annual payroll in excess of $14 million.

The project has led to implementation by the industry of short-run proposals which have substantially reduced the immediate problem. A continuing and essential EPMP effort includes the drafting of an effective regulatory wastewater ordinance which the industry can "live" with.

The importance to the Metropolitan Community of this relatively unpublicized and low visibility project cannot be overemphasized. Metro's Central Wastewater Treatment Plant, already overloaded and threatened by both state and federal regulatory constraints, cannot continue to receive the untreated solid waste from the meat packing plants. The packing plants themselves, even though working cooperatively with the environmental project, have economic limitations and might be forced either to reduce operations or relocate and rebuild at great expense -- and at some economic loss to the Nashville community.

Another accomplishment of the project was the completion of a hydrogeology and water quality analysis of the North Landfill of Metropolitan Government. This landfill, Metro's largest and one of the four that will be phased out almost immediately, is on a diked flood plain of the Cumberland River. The study was important, not so much as it pertained to the North Landfill (because of its imminent phase out) but because data pertaining to this flood plain would also be applicable to other flood plains of the Cumberland River.

The results showed that the North Landfill was not polluting the river, and that it is possible to fill in such a way as not to pollute the underground water table. The situation in regard to the hydraulic gradient at the North Landfill was not necessarily true in regard to all landfills, but this knowledge is helpful in locating other fills. Landfills with this same type of geology would probably have the same conditions.

However, the water table study has been more successful than the search for a solution to the solid waste crisis. Metro's immediate need is "at least" 100 acres for new landfills to dispose of the 1,200 daily tons of refuse collected in Nashville-Davidson County by public and private haulers. At this time the solid waste problem takes top priority with both EPMP and Metropolitan Government. There are no easy answers to this problem.

An immediate problem involves organization of an interim collection and disposal system before the Nashville Thermal Transfer Plant begins initial operation about twelve months from now.

The thermal transfer plant may be -- eventually -- the major answer to Metropolitan Nashville's solid waste disposal problem, but that solution is two or three years away. That program plans to use solid waste as a base fuel for conversion to the energy which will provide public and private downtown buildings with heating and cooling at a cost less than required to provide individual systems separately in each building. When the thermal plant begins operation, it will use only about 720 tons of solid waste per day for fuel. That is about half the total tonnage collected throughout the community. Between now and the plant's completion Metro must have more landfills; there will always be some need for this disposal method.

The EPMP is now engaged in the serious business of underwriting a full-time, continuing, one-man research project which will produce a workable, practical collection-disposal system for solid waste. It must fit both the interim, short-run demands of the current crisis and the lesser needs for the first-run (720 tons per day incineration) of the thermal plant.

The project held its first of a proposed series of eight "environmental workshops" on December 5-6, 1972. Over fifty leaders from the public, private and university communities attended. The purpose was "to integrate concurrent programmatic efforts to educate and to invite feed-back," and "to plan policy alternatives." An overview and delineation of the "packing house problem" was a major part of the first half-day of the workshop, with "solid waste management in Metro and other inter-related problems of environmental management" completing the afternoon agenda. On the second day, solid waste management and the impact of the Environmental Protection Agency constraints on the local scene were discussed, leaving the last half-day for a work planning session with task force members, project staff and key consultants.

Lynton Keith Caldwell stated recently in "Environment--A Challenge to Modern Society," that "Environmental administration can be given either of two interpretations... [The] first and more apparent meaning is the PURPOSIVE SHAPING OF THE HUMAN ENVIRONMENT BY MAN HIMSELF." This is the interpretation of what man does to his environment in the pursuit of his several and diverse activities. These actions include "his urbanizing, building, land-clearing, mining, industrializing -- and his attempts to dispose of whatever he wants to get rid of." Practically everything man does has some impact on his environment. Many of man's actions have a degrading effect on his surroundings, and there is a desperate and critical need to correct the damage before it is too late to cope with the problem. Caldwell suggests that the second, and today the more important, meaning of the term "environmental administration," must be "the control of human action in relation to the environment. Here the direct concern is not with the physical nature in the conventional sense, but with PEOPLE."

Essentially this must be the impact of the program to achieve significant improvement in management of the environment. The important achievement is the resulting benefits to the people of this community -- for the improvement of the quality of life in this Metropolitan community.

The unique "team effort" partnership proposes to utilize all of the community resources and will not overlook the most substantial resource of them all -- the concern of the people. "The environment is not administered," writes Caldwell, "it is the actions of people as they impinge upon the environment that becomes the direct focus of attention."

To put it in other terms, it is proposed that environmental change must be managed and directed, basically through the functions of government and public administration WITH THE COMPLETE UNDERSTANDING AND APPROVAL OF THE PEOPLE SERVED to preserve and regenerate environmental values for the benefit of the total Metropolitan community and for the region around it.

It must also be understood that the public has "a right to know" and this right (with the responsibilities knowledge implies) has a direct bearing on the project. A vehicle within the government to present the problems of the environment and the alternative solutions can provide motivation for the people to demand public action. Metropolitan Nashville can be whatever it wants to be. The urban community, the urban environment, will be what the people determine it SHALL be.

Environmental planning must be an integral part of "the action" if we are to substantiate the high hopes for a far better quality of urban life in Metropolitan Nashville by 1980.

We must learn to manage growth, change and the environment -- while we are growing -- and decide what goals growth should achieve.

Few cities have been able to absorb rapid growth and change and maintain an improving quality of life. It is our belief that this innovative program will enhance the changes for this accomplishment and that we will be able to look back from the broader perspective of 1980 and say: "We have become what we set out to be" -- and we hope that other leaders will look ahead and set higher goals for the year 2000.

CHAPTER IV: CITIZEN PARTICIPATION IN ENVIRONMENTAL MANAGEMENT

> "A major reason for citizen participation having successfully resisted generalization is the absence of a sizable enough body of empirical evidence from which to draw meaningful inference and conclusion. The evidence we do have is contradictory, inconclusive, particularistic, and overly qualified by the dictates of time, place, and circumstance."*

There is a growing awareness of the importance of citizen participation in the decision making process. Traditionally, many government officials have not often sought the opinions of citizens about environmental concerns for a number of reasons: time constraints, the presumed lack of knowledge and/or interest on the part of the public, the technical nature of the problem, lack of a suitable mechanism for obtaining outside opinions, or simply oversight. However, times have changed and citizens are now demanding a greater and more consistent role in environmental decision making. Some of the reasons for this include the following: the effects of pollution are being seen and felt by the public; helping to "save the environment" has been popularized; the press and educational institutions are creating a better-informed public; and finally, environmental deterioration has reached such proportions that major changes in life style may be required in some areas. For these reasons, it is no longer possible for a small number of public officials, no matter how competent, to unilaterally create and enforce environmental programs.

Recent legislative requirements, e.g., the 1972 amendments to the Federal Water Pollution Control Act reflect the practical necessity of seeking citizen input. In addition, citizens are demonstrating their eagerness to contribute to a better environment by personal volunteer efforts. These efforts are usually conducted by groups formed specifically for environmental purposes, such as the Isaak Walton League; groups which have environmental interests as well as other concerns, such as the League of Women Voters; and individuals practicing conservation in their personal lives. The emergence of recycling centers is an example of a citizen-conceived movement, often arising without official sanction. While the viability of recycling as a solid waste management strategy under the existent market system is debatable, it is a demonstration of the popular sentiment for conservation of resources. People are saying that they are willing to make some personal sacrifices for a better environment, that the trend toward increasing consumerism and growth should be tempered with a knowledge of the trade-offs involved, and that the "quality of life" as perceived by the general public includes environmental as well as economic values.

Citizen participation can take many forms; there is no simple formula for achieving it. Local conditions must always be taken into account in establishing, administering, and evaluating citizen participation. The meaningfulness of citizen participation can be described in terms of the following ladder ranging from high involvement to nonparticipation:

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*Hans B. C. Spiegel (ed.), Citizen Participation in Urban Development (NTL Institute for Applied Behavioral Science, 1968) Vol. 1, pp. 3-4.

Table I. LEVELS OF CITIZEN INVOLVEMENT

Increasing Degree —of→ Citizen Participation

Citizen Control
Delegated Power
Partnership
Placation
Consultation
Informing
Therapy
Manipulation *

In a lecture on techniques for involving the citizen in the urban transportation planning process, Daniel S. Cohen, U. S. Department of Transportation, described how these levels are manifested in implementation:

> The lowest two levels - manipulation and therapy - describe levels of "nonparticipation." The objective of this type of participation is not to enable people to be actually involved in planning or conducting programs, but to enable powerholders to "educate" or "cure" the participants.
>
> The levels of informing, consultation, and placation are higher levels of participation. In these cases, citizens' views are heard but there is no assurance they will be heeded.
>
> Further up the scale are levels of citizen power with increasing degrees of decision making power. The partnership level allows citizens to negotiate and engage in trade-offs with traditional powerholders. This level of citizen participation is characterized by two-way communication between the planning staff and the citizens.
>
> At the topmost level are delegated power and citizen control. In these cases, the citizens have the majority of the decision making seats or the full managerial power.
>
> A question which can be asked from this discussion of levels of citizen participation is, which level(s) is appropriate for the urban transportation planning process? As was mentioned previously, the approach to public involvement will vary between communities, and it is the responsibility of the decision makers in each community or region to decide the appropriate level.+

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* U. S. Department of Transportation, Federal Highway Administration, Lecture 5 by Daniel S. Cohen: "Goals, Objectives, and Evaluation Criteria."

+ Ibid.

The "partnership" relationship between the government and citizens deserves description because of the potential benefit for both partners. Public administrators who treat citizens as partners in striving for their common goals of environmental quality are not only aware of independent citizen groups and activities, but take positive action to work together and facilitate their programs. Returning to the example of recycling, public administrators would aid the viability of the recycling effort by using their position to press for changes in the economic and political barriers to recycling, such as prejudicial freight rates and depletion allowances. For example, a National League of Cities task force composed of mayors and city administrators recently made recommendations to enhance recycling resource recovery programs by the adjustment of federal policies that negatively impact resource recovery. If, on the other hand, the reclamation process itself is inherently too costly for recycling to work, citizens should be informed and redirected to more fruitful endeavors. The public official in a partnership role with citizens would not merely fulfill the legal and practical requirements in dealing with the public; he would also play an active role in the provision of environmental education and in utilizing public volunteer efforts where appropriate.

In Scottsdale, Arizona, an experimental program which utilizes citizens as a "resource" was undertaken in response to a citizen's recycling proposal for the city. To test the program proposed by the citizen in which homeowners were required to separate their own garbage, an experimental area of several square blocks was designated. Newspapers, glass, and other garbage were collected separately, the newspapers and glass then taken to recycling centers. These homeowners were the participants in an experiment on one aspect of the feasibility of recycling as a long-range strategy. Regardless of the outcome in the particular case of recycling, the willingness of the local government to share the decision making process and to treat citizens as partners is important for establishing a productive and harmonious relationship between citizens and government.

The mechanisms and strategies for obtaining citizen participation which are described in this chapter should be considered a starting place in the development of meaningful interaction between government administrators and citizens. The most important ingredient in a successful citizen participation program is still the responsiveness and interest of the government official; without that interest, even the most sophisticated citizen participation mechanisms are doomed to failure.

VOTING

Voting is the most fundamental form of citizen participation. However, in addition to the right of citizens to select their representatives, citizens also have the power to approve or disapprove bond programs and to vote on specific community issues raised in referenda.

The ballot box can be used as a positive strategy by citizens for effecting environmental goals. For example, the proposed 1976 Colorado Olympics were blocked by citizen action. Several citizens in the Denver area became suspicious that the projected cost figures for the Olympics were quite low compared to the actual cost of the Sapporo Olympics. Citizens in Evergreen community were also aroused because they had not been consulted in the planning stages, and they objected to the construction of parking lots and other detractions to their peaceful location. A citizens' group was formed in early 1972 called the Citizens for Colorado's Future (CCF). The group was funded by contributions. In order to get the referendum put on the state ballot, a petition with 51,000 signatures was needed (the number was based on a percentage of the number of votes cast in the previous election). The CCF actually obtained 76,000 signatures. In addition, the referendum was also placed on the City of Denver's ballot to assure that the City would not proceed independently of the State. CCF campaigned for the referendum through the media and handouts. On November 7, 1972 (Election Day) the referendum won on both ballots, with 180,000 plurality in the statewide vote.

PUBLIC HEARINGS

Public hearings are the most frequently used method for obtaining citizen participation due to the frequent legal requirement for public hearings; however, their usefulness is severely limited unless combined with other participation strategies.

Gerald Springer, Vice Mayor, Cincinnati, Ohio, discussed three basic weaknesses of the traditional methods of citizen participation, particularly the public hearing: (1) The emphasis is on procedure rather than on responsiveness; they are performed as prescribed but the information received is not necessarily incorporated in any systematic way to the planning processes. (2) Often vital information is not given to the citizenry; then their suggestions are discounted due to their "lack of expertise." (3) Citizen input is defensive in nature because it is often solicited after-the-fact, rather than in the earlier planning stages when change is still feasible. Furthermore, the public has no way of knowing whether the opinions expressed at the hearing have actually had any effect on the outcome. It is a one-way communication channel because of the typical structure of the meeting: The first half resembles a "staff briefing" with the lengthy explanations of the proposed plans; during the second half, the citizens virtually talk to each other, with little or no feedback from the staff. If the opinions voiced by the citizens do not appear to have affected the final outcome, even if there was good reason for not adopting their suggestions, citizens can become frustrated and angry.

CITIZEN ADVISORY BOARDS

A popular mechanism for obtaining citizens' viewpoints is via appointed citizen advisory boards. Typically there are two rationales used in selecting the board members. One is to select a cross section of the population to create a microcosm of the community. This type of board is particularly useful for soliciting their opinions on proposals before public release, assuming that the board's reactions would be a fair sample of the community reaction. The other rationale is to select members on the basis of their expertise in specified fields. This interdisciplinary group is most useful for performing studies and making recommendations to the city administration. Rather than emphasizing "the citizen viewpoint" per se, this type of board utilizes resources available within the population.

In Cincinnati, the Citizens' Environmental Task Force has completed a detailed year-long study of Cincinnati's environmental problems. The Task Force is composed of about thirty private citizens who have expertise in specific environmental areas and serve without compensation. The major areas which they investigated were air, water, noise, land use, solid waste, and energy conservation. Their report to the City Council was submitted in June, 1973, in a 250-page document to be publicly released.

The Cincinnati Citizens' Task Force consists of a Chairman, appointed by the mayor and approved by the City Council; an administrative assistant and secretary, hired by the Task Force Chairman; a Vice-Chairman, appointed by the Chairman; and six subcommittees. Each subcommittee selected its own chairman. Each subcommittee was charged with writing the final report and recommendations in its area. They held at least one public hearing, submitted status reports at the Task Force meetings, and distributed the minutes of their meeting to all the committee members.

The Dallas, Texas Citizens' Environmental Quality Committee was established in July, 1971. It was "charged with the development of a city-wide environmental policy encompassing the activities of both government and private entities. The primary goal was to identify citizen perceptions and ambitions and not to design the strategy or the machinery for the achievement of goals," according to George Schrader, City Manager of Dallas. The committee was multidisciplinary in composition and received staff support from employees who worked full-time with the committee in defining and researching problem areas. Mr. Schrader described the activities the committee has been performing: "The initial fact-finding phase consisted of the acquisition of personal testimony from city program administrators, regional urban affairs officials, and state and federal agency officials. Written statements were also solicited from a select group of local scientists, educators, conservationists and community leaders. More recently, the committee held public hearings to obtain further knowledge of the citizens' perceptions of the problem. Based on this varied input, the committee began composing policy recommendations last March and will present their findings to the City Council in late June, 1973. This effort will certainly significantly influence future city activity."

An advantage of citizen advisory boards is the provision of two-way communication at regular meetings, with continuity of interaction. Staff support from the city administration strengthens the board's effectiveness and credibility. The disadvantage of these boards, however, is the tendency to rely upon the citizens' board to the exclusion of the remainder of the population, on the assumption that the board represents the citizenry as a whole.*

*Alternates to the structures and uses of citizen advisory boards are discussed by Michael P. Ryan in "The Role of Citizen Advisory Boards in Administration of Natural Resources," Oregon Law Review, Vol. 50, 1971 (p. 153).

A special type of citizen board is the conservation or environmental commission which is an official agency of local government consisting of citizens who are appointed to serve without compensation for a fixed term. These commissions derive their legitimacy from state enabling legislation and municipal ordinance, having accessibility to state and federal funds, and permitting intra- and inter- municipal action. The first such commission was created in Massachusetts in 1957, and others have subsequently been adopted in other New England and northeastern states.

The activities of these Commissions include acquisition, coordination, and planning for the protection of the environment. The coordinating role enables commissions to work with local environmental groups. In Hanover, Massachusetts, the Conservation Commission became the coordinating body in a group effort to protect and preserve the North and South rivers. Commissions can become a focal point for the organization of environmental projects, and can provide the impetus for natural resources planning. In addition, commissions may, subject to approval of the governing body, acquire property in the name of the municipality by gift, purchase, grant, bequest, devise or lease, and are empowered to administer the use of that land. Besides these special powers, commissions are also empowered to conduct studies and make recommendations in the same manner as other citizen boards.

The most important difference between advisory boards and conservation commissions is state sponsorship , eligibility for state funding, and the ability of the commissions to acquire and control land. The need for comprehensive planning before selecting the sites for acquisition tends to put the emphasis on conservation and open space rather than on pollution abatement.

Whether the commission approach will prove to be applicable to large cities, varying so greatly from the typical New England town where these commissions developed, is a question which remains to be answered; as one meaningful approach to the involvement of outsiders in the governing body, the conservation commission has many advantages.

LEGAL ACTION

Individual citizens and citizens' groups have the legal right to help decide the future of the environment. John Goodman, Technical Assistance Research Programs, cited the legal requirements for public participation which government administrators cannot afford to ignore. Section 101 (e) of the Federal Water Pollution Control Act stipulates that public participation shall be "provided for, encouraged and assisted by the [EPA] Administrator and States" in the "development, revision... of any... plan or program established by the [EPA] Administrator or State." The proposed regulations to implement section 101 (e) emphasize the need for public participation in the early stages of decision making.

> ...active public involvement in and scrutiny of the intergovernmental decision making process is essential... Conferring with the public after an agency decision has been made will not meet the requirements of this part. (40 CFR 105.2)

The guidelines also require that before any agency action is taken on a plan or program, such as approving a construction grant application, a "summary of public participation" must be submitted.

A citizen has the right to take court action against any violator of his rights. Under the Refuse Act of 1899, individual citizens can report the illegal discharge of effluent into navigable waters; if the report leads to a conviction, the citizen is awarded one-half of the amount of the fine.

The establishment of a local board of appeals is a formal mechanism for receiving citizen appeals. Gerald Springer described the Cincinnati board of appeals established under their air pollution control ordinance. Individual citizens or groups can appeal decisions made by the administration, and the board has authority to override the earlier decision. Norman Redlich, Corporation Counsel for the City of New York, described the creation of the City's Environmental Control Board, an administrative tribunal for enforcement of the provisions of the City's codes and ordinances. It hears citizen complaints and has the option to decide whether or not to prosecute on the basis of a complaint. If the Board declines to prosecute, the citizen may proceed at his own expense. If a conviction is obtained, the citizen receives a bounty, based on a sliding bounty system whereby the percentage of the fine the citizen receives is greater if the city was wrong and failed to prosecute.

Suits brought by environmental groups and individuals play an important role in checking the actions of government officials at all levels. Often citizens have been successful: in enforcing stronger provisions than the government would have done, e.g., the non-degradation suit; in forcing compliance with existing regulations, e.g., the Greater-Washington Alliance to Stop Pollution, Inc. (GASP) proceedings against the Washington Metropolitan Area Transit Commission (WMATC); and in the discovery of a new enforcement mechanism, as when Congressman Henry Reuss in 1971 brought suit against 270 companies in his home state of Wisconsin in order to establish the power of the 1899 Refuse Act.

EDUCATION

The importance of a well-informed citizenry is an essential prerequisite to achieving meaningful citizen participation. Citizens often require a basic education on the issues, in addition to the latest developments. This is particularly true in the field of the environment because it is a relatively new concern and because of the recency of much of the information.

In Dallas, an environmental public information program is one attempt to meet the educational needs of the public. George Schrader, City Manager of Dallas, described an exhibit which presented various environmental options for a future Dallas which was co-sponsored by the Dallas Museum of Fine Arts and the City of Dallas:

> ...The show went beyond the traditional approach of presenting facts and figures in a passive format. The exhibit involved

> direct spectator participation by requiring the viewer to make decisions on specific housing, transportation, recreation and urban design alternatives.
>
> The display consisted of a labyrinth of tunnels, each passageway representing a specific option. Before being exposed to the various externalities associated with each option, the participant was asked to choose and record all decisions on a questionnaire. The exhibit then culminated in a six screen audio-visual display which explored the future implications of each decision. In this manner, the public was informed not only about the current tradition of our local environment but also about the trade-offs involved in decision making relative to guiding the future of Dallas. This information emphasized to the citizens the existence of environmental options and choices which will in the future be made by omission or commission.

Mr. Schrader also discussed another educational program in the City of Dallas public school system:

> ...The City of Dallas, the American Institute of Architects, and the American Society of Landscape Architects have recently joined a privately sponsored Community Design Center in developing a pilot project within the local public school system. Aimed at grades fifth through seventh, the project will consist of a careful environmental study by the students of the neighborhood surrounding the school; communication of the results of the study to peers and adults through written descriptions, drawings, photographs, films, tape recordings, oral reports, models, etc.; and efforts at the implementation of the reported suggestions made by the participating children.
>
> The role of the City will be to provide assistance for teachers in the initial planning phases as well as in the implementation phase. Ultimately, the aim is to develop a packaged program as a result of the pilot experiences.
>
> Another prospective project is the preparation of a "speakers kit" which will consist of various materials to aid elementary school teachers in preparing and presenting environmentally-related lectures. Expansion of the current classroom lecture series to include encounters with the public and private sectors is also envisioned. This program would help students to cultivate environmental tastes and to identify and order their values.

An effective method for citizen education which Mr. Goodman described is to hold special workshops for citizens. By scheduling workshops on a particular topic early enough in the planning stage of a project, a group of interested and informed citizens will be able to provide valuable reactions to preliminary plans. Workshops should be small enough to encourage discussion and communication in addition to teaching. Ideally, local planners and administrators with expertise in the subject matter should be present at each workshop meeting. Workshops should not be held only at the inception of a project but should be offered routinely to create an ongoing citizen/local official communication and educational mechanism. In this regard, Mrs. Ruth Clusen, Vice-President of the National League of Women Voters, stressed the need for citizens and groups to know the steps of the governmental processes including individuals to contact on various matters. The workshop should be the initial contact between citizens and the governing body, designed to encourage future interaction as well as to inform the citizen on the particular topic.

An important incentive to the pursuit of active citizen involvement through workshops is the provision in federal construction and planning grant regulations that workshops are an allowable expense; seventy-five percent of the cost of a workshop connected with a specific project can be financed through a federal grant.

GENERAL ADVICE FOR IMPLEMENTATION

Mrs. Ruth Clusen, drawing upon her experience as the Vice-President of the League of Women Voters, offered advice to government administrators on dealing with the public. The first suggestion is not to patronize or talk down to a citizen; it is preferable to assume that the citizen knows more than he actually does than to treat him as what Mr. Springer humorously described as the "proverbial dumb layman." Second, involve people from the beginning, rather than inviting them in to rubber stamp a "fait accompli." All of the speakers emphasized this obvious but often ignored necessity. Third, be frank and honest to citizens and do not hesitate to describe the trade-offs involved. Offer technical assistance including scientific, technical and professional advice; citizens usually lack the resources to acquire the needed information. Workshops and educational programs were discussed by Messrs. Goodman and Schrader as methods to meet this need. Fourth, do not expect support on every subject. Fifth, spell out the processes and complexities of government, including referral to individuals within the system who can offer further assistance. Do not consider citizen participation an adversary procedure; it can and should be a productive interchange. Finally, receptiveness to the ideas and opinions of citizens is essential.

IMPLEMENTATION OF CITIZEN PARTICIPATION IN THE MUNICIPAL PROCESS

John Goodman, Joseph Falkson, Barbara Mertens, Lindsay Happel*

INTRODUCTION

Citizen participation in environmental management has been viewed as a good idea by both municipal officials and planners. But, even though it is recognized that it would improve planners' responsiveness to community needs, participation has not always been encouraged or implemented for fear that it would create political conflict and delay projects. However, today's citizens are more articulate, more aware of their rights, and more sensitive to environmental issues. While most municipal projects could be built with no citizen involvement, the risk of expensive, time consuming delays and court suits is increasing dramatically. Due to changes in citizen's attitudes and new federal regulations, implementation of citizen involvement is no longer simply a luxury or a "good thing to do." It is a necessity.

This paper will briefly outline sample requirements for participation, discuss the most prevalent mechanisms (e.g., public hearings, citizen advisory boards, and workshops) used to fulfill these requirements, and then will point out pitfalls to avoid in implementing these mechanisms.

REQUIREMENTS FOR CITIZEN INVOLVEMENT

LEGAL REQUIREMENTS

The following discussion of the legal requirements for participation in Water Quality Management is included to serve as an example of the requirements being attached to federal environmental funds.

Section 101(e) of the Federal Water Pollution Control Act Amendments of 1972 broadly stipulates that public participation shall be "provided for, encouraged and assisted by the EPA Administrator and

*Presented by John Goodman, Technical Assistance Research Programs (TARP), at the National Conference on Managing the Environment.

States" in the "development, revision...of any...plan or program established by the EPA Administrator or State."*

The proposed regulations to implement Section 101(e) very strongly emphasize the need for public participation early in the stages of policy formulation. They specifically state that:

> Conferring with the public after an agency decision has been made will not meet the requirements of this part. 40 CFR 105.2

This regulation states that substantive participation, not after-the-fact review, is required in the development of a plan or a federally funded municipal project. The guidelines also require that before any agency action is taken on a plan or program, such as approving a construction grant application, a "summary of public participation" must be submitted.+ Such a requirement, if strongly enforced, will insure that states include participation in all activities covered by the Act.‡ The development of state strategies and waste treatment

*"(e) Public participation in the development, revision, and enforcement of any regulation, standard, effluent limitation, plan, or program established by the Administrator or any State under this Act shall be provided for, encouraged, and assisted by the Administrator and the States. The Administrator, in cooperation with the States, shall develop and publish regulations specifying minimum guidelines for public participation in such processes."

+"Each summary of public participation shall describe the measures taken by the agency to provide for, encourage, and assist public participation in relation to the matter; the public response to such measures; and the disposition of points raised." 40 CFR 105.15(d)

‡The 1972 Amendments also require a public hearing prior to the establishment of any effluent limitation standard. The Governor of a state or the State Water Pollution Control Agency must also from time to time hold public hearings for the purpose of reviewing applicable water quality standards (Section 307 of Federal Water Pollution Control Act Amendment). The new regulations implementing Section 303 of the Amendments stipulate that public participate "with adequate opportunity for public hearing upon proper showing" will be required in for the proposed state strategy and priority list of the planning process. The regulations also state that:

> ...plans will be officially adopted, after appropriate public hearings, as the official water quality management plans of the State and that the plans may be revised, after public hearings, as appropriate. 40 CFR 130.32

priority lists require public hearings to give the public a chance to comment on the priorities presented in the plans. The amendments also state that a citizen has standing to take court action against the Federal Government or any other authority in violation of the mandatory requirements of the Act. New York and several other states authorize environmental advisory boards at the municipal level. The very existence of these boards requires the municipal official to consider their input.

PRACTICAL REQUIREMENTS

There is a growing tendency for citizens to sue or to complain to the funding federal agency when they feel there is bad faith on the part of a city official. If citizens are dissatisfied with the way the environment is being managed, and they have no way to make substantive input to the process, they have only to find an infraction of the regulations to delay projects, and do great damage to the municipal budget. Federal grant regulations are complex, and it is difficult for an official to be in compliance with all regulations.

CITIZEN PARTICIPATION MECHANISMS

Any effective participation mechanism must allow for two elements: education of the citizens and the response of the planners and officials to the citizens. In order to insure intelligent, objective participation by the public, the public must understand the nature of the problem, all the possible solutions, and the costs of these solutions. The municipal official, on the other hand, must respond to the input of the citizens, and insure that their input will have an impact.

Three public participation mechanisms which can include these elements will be discussed here: public hearings, advisory boards, and workshops.

PUBLIC HEARINGS

Public hearings, though most prevalent, are not necessarily the best means for participation. There is one major problem with hearings: the inability of citizens to be sure that they have had an impact on the planning process. Hearings allow little opportunity for constructive feedback from the hearing officer on whether the public's views have influenced him or not. If the public feels that they have had no impact through the hearing process, frustration builds. Such frustration may lead to civil suits, court injunctions, and delays in project implementation.

ADVISORY BOARDS

Citizen advisory boards are more acceptable because they allow two-way communication. The boards provide the municipal officials with a channel for dissemination of information to the community and also provide the public with the opportunity to convey its values and viewpoints to the planner. Boards are also useful in helping a municipal official anticipate public reactions.

Problems may arise, however, which can hinder the effectiveness of the boards. The board members may be unsure as to their function and/or may be inadequately prepared to evaluate technical information and offer substantive advice. City officials may find it impractical to heed the board's advice.

Many of the problems encountered with public hearings and advisory boards can be avoided, or at least decreased, if the city official realizes early the need for a mutually supportive, two-way relationship with the public. The third participation mechanism being discussed here, workshops, provides the framework for this two-way relationship, and should be utilized in conjunction with public hearings and advisory boards.

WORKSHOPS

Workshops are excellent teaching mechanisms which allow timely and substantive input from citizens and planners alike. They provide interested citizens with the tools to make intelligent decisions and they provide planners with data and alternatives.

The workshops should be oriented to a particular project or issue. If the workshops are being utilized to encourage general participation, or to initiate a city-wide citizen advisory board, it is still advisable to plan them around a specific problem. This will provide all participants with "something to get their teeth into." It will also provide a model for holding future workshops, where solving a particular problem may be an imperative.

An advisable strategy for the workshops is to hold separate sessions for the citizens and city officials, in preparation for the two groups actually getting together.

For the citizens, the workshops should include the following:

(1) The legal requirements for participation. The implications of the law should be delineated in practical terms (e.g., what information is required to be provided, what participation mechanisms may be set up, etc.).

(2) An examination of the process of the workshop subject. This should include the administrative stages of the plan-

ning and implementation process, and a relatively non-technical discussion of the planning principles and technology being applied.

(3) A discussion of the advantages and disadvantages of different citizen participation mechanisms. Advisory boards, workshops, public hearings, as well as lobbying, lawsuits, and the concept of citizen advocates should be discussed. Practical operational problems of making input such as organizing citizen leadership, obtaining technical consultants, and timing actions appropriately need to be explained.

(4) Utilization of case studies. Case studies are recommended here in order to give citizens experience in evaluating alternatives and making group decisions. The case studies should concern different citizen actions, as well as different planning decisions related to the workshop subject.

Much of the information provided for the citizens should be provided for the planners and city officials, although from a different perspective. For instance, the practical delineation of the legal requirements for participation would include when and how the public should be notified of projects, what information should be provided, etc.

The planners should also be given:

(1) Advice as to methods of implementing participation. This would not only include mechanisms that may be utilized, but practical means of implementing them (e.g., who should be represented on a board, how these people should be selected, what role the board has, etc.).

(2) Effective means of notification of citizens. Early and wide-spread notification of the public of all plans and meetings is essential to the prevention of project delay. More publicity is needed than just an item in the notices section of the newspaper.

(3) Utilization of case studies. Case studies for the planners should concentrate on successful and unsuccessful means of implementing participation. Planners should be shown what has happened in the past, and be given the tools to deal with similar problems that they may face.

Once the citizens and planners or officials have been given all the information they will need to work effectively with each other in the municipal environmental process, they should be brought together in order to formulate plans for on-going cooperation. Role playing might be utilized here, and the dynamics of group process illustrated through problem-solving exercises.

One fact which is not widely known is that the cost of workshops, like public hearings, is an allowable expense under federal construction and planning grant regulations. This means that seventy-five percent of the cost of a workshop connected with a specific project will be paid for by the Federal Government.

POINTS TO REMEMBER IN IMPLEMENTING CITIZEN PARTICIPATION

Whichever mechanism, or combination of mechanisms, you choose, there are several points that should be kept in mind. First, the citizen participation mechanism must not be merely a public relations effort. Citizens are now sophisticated enough to see through a sham. Experience has shown that if citizens do not feel that the established mechanism is serving a functional purpose, they will not hesitate to establish their own mechanism, whether it be picketing, organizing a separate citizen's group for lobbying purposes, or going to court.

Citizens and municipal officials must have a clear understanding of their individual role in the mechanism. Conflicting expectations by the citizens and the planners can render the mechanism ineffective. For example, if the role of a board is simply defined as "to make input," citizens often assume they are to make policy. The planner, on the other hand, may assume that they are only to give advice. When this situation occurs, bad faith is charged and conflict develops. A recent sample of this occurred at the Columbia Point Health Center, in Boston. The Center Director felt that his advisory board had no decision making authority. When he chose to ignore their input, the board and the citizens represented by the board became extremely frustrated. In this case, actual violence broke out.*

Finally, it must be remembered that timing is important in the implementation of citizen participation. The board must be consulted, the public hearing held, or the workshop must be run prior to the decisions being made. Timing makes the difference between active participation and after-the-fact review.

Effective participation, if properly implemented early in the planning process, will help reduce conflict and increase the long-term efficiency of your municipal process.

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*See "Seige at Columbia Point," Time Magazine, October 30, 1972.

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CHAPTER V: STRATEGIES FOR MANAGING THE ENVIRONMENT

In the past, when a government official was asked what his agency was doing to improve the quality of the environment, his response was nebulous at best. A federal or state official might have discussed his ineffective environmental quality standards, or pointed out that environmental problems were the responsibility of local governments. A local official might have pointed to collection and disposal methods of solid waste or to a sewage treatment plant.

If an environmental crisis, such as the severe pollution of a nearby stream, were to occur, governments had very few means of solving that immediate problem. Their alternative responses included: ignoring the problem and hoping that it would improve itself; if the source of the pollutant could be identified, talking to the polluters in the hope that they would improve the situation; if a nuisance did exist, threatening or initiating a legal action, and applying political pressure or economic sanction on the major polluter.

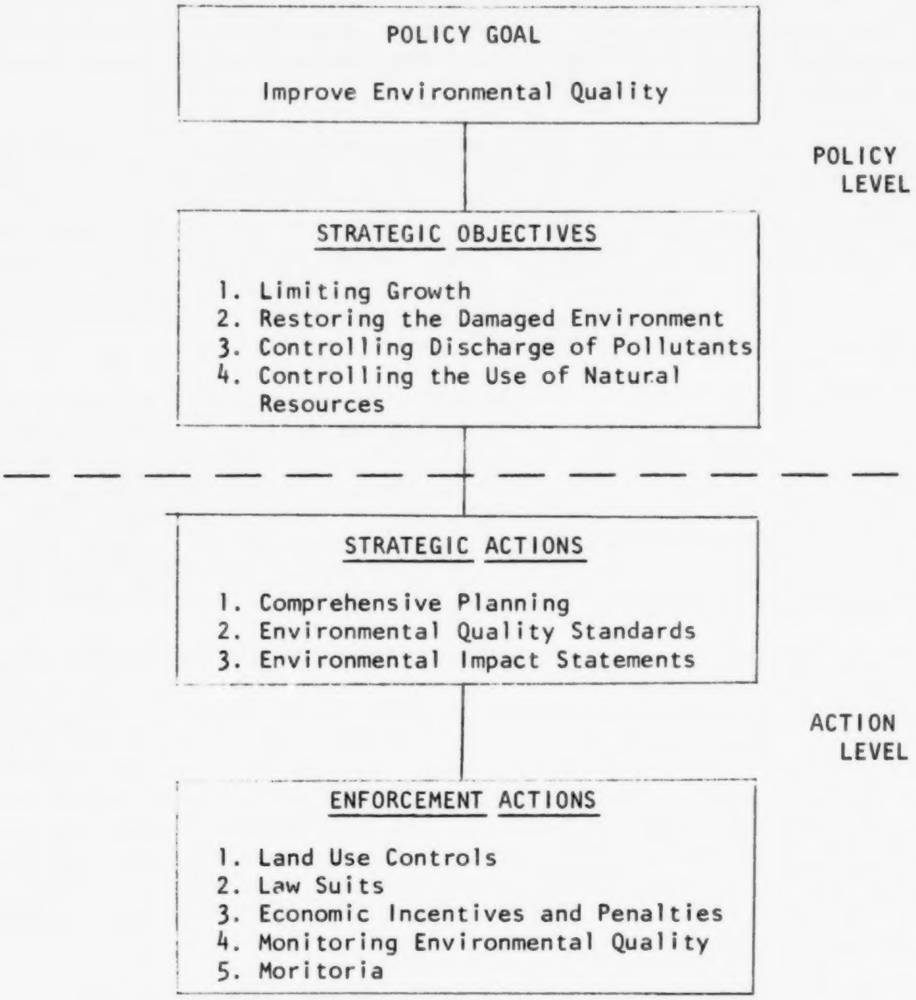
The ineffectiveness of the traditional approaches toward environmental management is realized when one looks at the multitude of environmental problems today. During the past few years, all levels of government have begun both to develop and test new strategies for environmental management and to modify the traditional strategies for today's problems. The National Conference on Managing the Environment was an attempt to see how far governments have come in developing processes and techniques for managing human and natural resources for improving environmental quality.

Since the complexity of environmental management can be overwhelming, even to a knowledgeable observer, a rather simple framework is presented as an aid to understanding the involvement of government in environmental management. For example, the issue of controlled or restricted growth could be viewed from many perspectives, as a policy statement outlining some goals, a plan for action or an enforcing process. Although this framework, as presented in Figure 1, has some obvious weaknesses, such as drawing a sharp dichotomy between policy and action (ends and means), it does clarify the relationship and develop a typology of various environmental strategies. The framework identifies four basic categories of strategies for managing the environment:

> Policy Goals, which are general statements outlining the overall improvement of environmental quality and the quality of life:
>
> Strategic Objectives, which are specific policy objectives such as limitations or controls on growth, restoration of the damaged environment, controls on the discharge of pollutants and controls on the use and misuse of natural resources;

Figure 1.

STRATEGIES FOR MANAGING THE ENVIRONMENT: A CONCEPTUAL FRAMEWORK*


POLICY GOAL
Improve Environmental Quality
POLICY LEVEL
STRATEGIC OBJECTIVES
1. Limiting Growth
2. Restoring the Damaged Environment
3. Controlling Discharge of Pollutants
4. Controlling the Use of Natural Resources
STRATEGIC ACTIONS
1. Comprehensive Planning
2. Environmental Quality Standards
3. Environmental Impact Statements
ACTION LEVEL
ENFORCEMENT ACTIONS
1. Land Use Controls
2. Law Suits
3. Economic Incentives and Penalties
4. Monitoring Environmental Quality
5. Moritoria

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*For a detailed discussion, see Lyle J. Sumek, "A Conceptual Model for Environmental Management," an unpublished paper. The paper can be obtained through the Graduate School of Public Affairs, University of Colorado.

Strategic Actions, which are broad actions such as comprehensive planning, assessment of environmental impact, and adoption of standards for environmental quality; and

Enforcement Actions, which are designed to compel compliance with the strategic objectives and actions such as land use controls, law suits, economic incentives and penalties, moritoria, and monitoring environmental quality.

Three related factors which affect the development of environmental management strategies are the current state of technical knowledge and research progress on the environment, the construction and modification of equipment and facilities and the organizational arrangements for administering environmental management programs.

In using the framework, this paper focuses on new actions which are being taken by governments to improve the quality of the physical and social environment. The purposes here are: to provide a model for understanding the interrelationships between the adoption and implementation of policy and strategic environmental management actions taken by governmental bodies; to analyze the various ideas evolving out of papers and panel presentations at the National Conference for Managing the Environment; to identify and analyze innovative actions taken by local government, with the realization that many of these innovative actions, while appropriate in one setting, may need to be adapted to the needs and constraints of a new setting; and to analyze the modification of more traditional actions in environmental management which are being adapted for use in different problem areas.

UNDERLYING ASSUMPTIONS OF ENVIRONMENTAL MANAGEMENT

The new strategies for managing the environment are generally looked at in terms of maintaining the ecosystem in a dynamic state of equilibrium, of improving and restoring environmental quality, and of retaining the value of materials throughout the ecosystem. The ecosystem is defined as stable when the different members mutually support the continued existence of other members in the system. In order to help understand the changes in recent environmental management strategies, an appropriate starting point would be to analyze the changes in underlying assumptions which function to guide programs for improving environmental quality and the use of natural resources.

Natural Resources as Finite

In the past, the natural resources of the earth were viewed as being infinite. Man could consume as much of the resources as he needed without worrying about running out of resources. The inaccuracy of this assumption is vividly demonstrated in the depletion of energy sources in the United States which has resulted into today's energy shortage. Environmental managers have begun to view the earth as a closed system with limited amounts of resources. Man is dependent upon the life support systems of our planet: food, oxygen, and disposal of waste. A smooth-functioning system is necessary if man is to survive. The stability of the ecosystem depends in large part upon its complexity. However, man has been turning fields into buildings, thus reducing the complexity of the earth's ecosystem and increasing the danger of a large-scale malfunction of the life support system. One only needs to look around to identify various visible breakdowns in the system which threatens man's survival.

Man-Nature Symbiosis

Since his first days on earth, man has viewed nature as a hostile force with which he must contend. In order to survive, he thought that he must dominate it; have the right to control it to fulfill his needs for survival; and if necessary, exploit it without regard to the consequences. The disappearance of many wildlife species and the scars on the earth's surface left from strip mining are monuments to this falsehood. Environmental managers are realizing that man must learn to live as part of nature. Since man is living in an age of science, he may have to abandon some traditional values and some crude, destructive technologies which attempt to control nature. He is learning to regard nature with more respect so that his way of life and use of technology are more in harmony with nature.

Scarcity of Natural Resources

Scarcity in the environmental context is defined as the lack of fulfillment of man's needs and economic growth. With the increased automation of production and the accompanying rise of affluence, man has come to have more artificial needs. For many, a high standard of living is achieved through a high consumption rate and hence quantity counts more than quality of life. Furthermore, he appears more concerned about the scarcity of consumable products than the scarcity of certain wildlife species. To meet his demands, more and more resources were used without question. This has resulted in the environmental manager defining scarcity in terms of natural resources. In many communities citizens are facing a shortage of drinking water and the disappearance of the natural environment.

New Technologies for Nature

Since the linkage of science and technology during the middle of the nineteenth century, man has attempted to accumulate more and more technology without questioning either the ultimate goal or uses of technology or the consequences of its use. Technological development has become a goal rather than a means. Man cannot reject science and technology to retreat to a more primitive state. It has become a vital part of our civilization. Since it would be impossible at this point in time to give up our present level of knowledge, the environmental manager must accept the consequences of our past uses of technology and realize that continued use of these old technologies may result in some form of eco-disaster.

Thus, new strategies for managing the environment are being developed, based upon the new set of assumptions. For example, new air and water environmental quality standards and enforcement processes are aimed at maintaining, and hopefully restoring, some stability in the ecosystem. The improved quality of polluting discharges has resulted in the revitalization of lakes and rivers previously considered dead. In addition, the assessment of environmental consequences of programs and projects is attempting to improve the relationship between man and nature, to reduce the likelihood of further elimination of some natural resources, and to limit technological ravaging of nature. Environmental managers are becoming guardians of the earth's resources.

ADOPTION OF ENVIRONMENTAL POLICY STATEMENT

One of the first steps taken by many local governments has been the adoption of a policy statement concerning environmental quality and outlining environmental management programs. Before we progress too far, it may be appropriate to clarify what a policy statement contains. In "The Study of Policy Content," Austin Ranney has identified five major components of any policy statement, including: a particular object or set of objects which are to be effected; a desired course of actions detailing a sequence of desired behaviors; selected lines of actions which delineate one course of action selected from many; a declaration of intent which is a statement of what policy makers intend to do; how, and why, and implementation of the intent.* In the environmental policy area, like other policy areas, the adopted statements have emphasized different components. Some policy statements, in primarily addressing themselves to identifying the set of objects and a declaration of intent, formulate a general environmental goal. Yet, other policy statements, in detailing different courses of action, stress the development of strategic objectives for environmental management. It should be noted that there will be elements of both general goals and strategic objectives in any policy statement adopted by a governmental body.

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*Austin Ranney (ed.), Political Science and Public Policy, Chicago: Markham Publishing Company. 1968.

General Environmental Goals

In recent years, many governmental bodies have developed and adopted a general environmental statement. Before going on, it is important to make the distinction between official policies and operating policies. In many cases, the official policies adopted by the legislative body may not be reflected in the day-to-day administration of environmental programs.

The federal government was one of the first to act when the National Environmental Policy Act (NEPA) was passed in 1969. The act outlines a national policy which encourages productive and enjoyable harmony between man and his environment, promotes efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man, and enriches the understanding of the ecological system and natural resources important to the nation. The intent of this general policy statement was to declare that:

> It is the continuing of the federal government, in cooperation with state and local governments, to use all practical means and measures including financial and technical assistance in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic and other requirements of present and future generations of America.

NEPA also pointed out the areas of federal responsibility for environmental management. The federal responsibilities include: (1) fulfillment of the responsibilities of each generation as a trustee of the environment for succeeding generations; (2) assuring that all Americans have safe, helpful, productive, esthetic and culturally pleasing surroundings; (3) attainment of the widest range of beneficial uses of the environment without degradation, risk to safety of health, or other undesirable and unintended consequences; (4) preservation of important historical, cultural, and natural aspects of our national heritage; (5) maintenance of an environment which supports diversity and a variety of choice; (6) achievement of a balance between population and resource use which permits high standards of living and a wide sharing of life's amenities; and, (7) enhancement of the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

One of the more controversial aspects of NEPA was a statement in which each person was originally granted the right to a healthful environment. After considering the objections, Congress modified the act to reflect that each person should enjoy a healthful environment and has a responsibility to contribute to the preservation and enhancement of the environment. However, at least seven states has guaranteed to their citizens the right to clean air and water in the state constitution.

Thus, NEPA outlines a general policy which is to be used to guide environmental programs and actions of the federal government. It should be emphasized that many of the goals in NEPA are in disagreement with the goals of other legislation. For example, the environmental concerns as expressed in NEPA may be in conflict with some aspects of federal highway programs. Only through the implementation of various actions for managing the environment will the conflicts be resolved and the operating environmental policy be clarified.

At the local level many cities are adopting their own general environmental policy statements in the form of a "mini NEPA" ordinance, resolution on the environment, or statement in the comprehensive plan. In a recent survey conducted by ICMA, it was found that just under twenty percent of the respondents had adopted some formal general environmental statement on policy and goals while fifty-seven percent had not.* The remaining twenty-three percent are presently considering adoption of some form of general environmental goals. Furthermore, of the cities with a population of over 500,000, more than half have adopted environmental policies. It is not surprising that local governments followed the lead of the federal government with most of the environmental policy statements being adopted in 1971 and 1972.

A typical environmental policy at the local level is reflected in the statement adopted in November 1972 by Westminster, California. The environmental element of the comprehensive plan states that "the policy of the citizens and the government of Westminster is to enhance and maintain property to high esthetic standards, minimize adverse environmental impact of urbanization and industrialization, and eliminate deteriorating environmental situations or processes in order to achieve a community compatible to wholesome psychological, physiological and sociological growth."

Strategic Objectives

A second type of policy statement which can be adopted by governmental agencies involves the adoption of a specific objective for city operations. Generally, four major types of strategic objectives are commonly being adopted by local governments. They include the control and possible limitation of growth within a community, the control of pollution discharges into the natural environment, the prevention of further deterioration of natural resources and environmental quality, and the restoration of environmental quality in areas where pollution has taken its toll on the ecosystem. Since it is impossible to analyze all four strategic objectives, here the focus is on managing growth.

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*See Steve Carter, Murray Frost, and Lyle Sumek, Environmental Management and Local Government: Problems and Perceptions. A report conducted under the Environmental Studies Division and prepared for the Office of Research and Development, U.S. Environmental Protection Agency, 1973.

At a national conference, sponsored by the Rockefeller Brothers Fund, on May 24, a task force chaired by Laurence Rockefeller reported on land use and urban growth.* The group's policy statement calls for the abandonment of the deeply ingrained idea that private ownership of land carries with it the right to develop the land. After much study and analysis, they arrived at three major conclusions. First, the task force identified a new mood which is reflected in the public demand for no more growth at any price. At the local level, that attitude has manifested itself in the establishment of a growth ceiling in Boca Raton, Florida, the land use regulations along the coastline in California, and the purchase of land for greenbelt development in Boulder, Colorado. Second, the task force concluded that increases in population and the accompanying demand for new homes and housing and other forms of services will continue well into the twenty-first century. Those pressures will be compounded by the continued rise in family income and level and personal consumption. For many local governments who are presently using the maximum natural resources (e.g., present municipal use of available water), this means that some alternative strategy for managing growth must be developed in order to avoid disasters. Finally, the task force concluded that the success in reconciling political pressures for growth and the demands for a better quality environment will depend on guiding and restricting development without necessarily compensating owners for restrictive use and possible decrease in market value. They called for the development of new protective regulations regarding open space.

During the Conference's workshop on growth, Martin Johnson, Secretary of the Agency of Environmental Conservation, the State of Vermont, stated that growth must be limited for the good of everyone. However, before developing strategic objectives on growth limitation, the region's carrying capacity should be determined. In his paper "The Concept of Carrying Capacity," found in the latter part of this chapter, A. Bruce Bishop, Assistant Professor of Civil and Environmental Engineering, Utah State University, defines its use in terms of biological or physical relationships between a given resource stock and its maximum sustained yield. A determination is made as to the maximum number of individuals of a species that can be supported by a given habitat under various conditions of stress. A common question asked is: what is the capacity of the reservoir and the river downstream to maintain natural water quality levels and continue the support of existing ecosystems This is particularly important to local governments which are reaching the limits on their water supply. Other questions include: what will be the impact of air quality conditions with increased traffic and housing and commercial developments? What animals and plants will be displaced by further development of open space? The carrying capacity is a concept that has a rather long history in resource management, particularly as it relates to the limiting of livestock according to available food supply and water. In concluding, Mr. Bishop points out that the similarities among natural ecological systems suggest the use of a new broader method of describing resources of the human environment for environmental management.

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*The Use of Land:A Citizen's Policy Guide to Urban Growth, New York: Crowell, 1973.

In conjunction with the research on the carrying capacity of a region, it may be important to conduct an environmental resources inventory analysis. Roger Hanson, Executive Director, The Rocky Mountain Center on the Environment, suggested during the growth workshop that environmental managers must have a valid environmental data base as a starting point for the development for any growth policy. This inventory would identify and locate of the major elements of the ecosystem including climate, geology landforms, surface water, botanical biomes, wildlife species and historical and cultural landmarks and current land use patterns. In the long run, this data could be used as a basis for enforcement that is scientifically and legally defensible.

According to Martin Johnson, once the data is developed, environmental managers can proceed with a three step plan. First, social goals need to be developed and defined including the opportunity for health, happiness, education, recreation, and diversity of experience. Second, in developing a plan for achieving the goal, a comprehensive approach must be taken considering the availability of resources in the region and the state of the environment. This plan could be incorporated in the environmental section of the comprehensive land use plan and should include settlement patterns, transportation patterns networks, economic base, energy requirements, natural resources, recreation facilities, among some. Finally, enforcing or policing powers must be developed to regulate the implementation of this strategic objective.

Summary

In developing either a general environmental policy statement or strategic objectives, environmental managers must keep in mind, or avoid displacing, these goals through an overcommitment to specific environmental actions. In other words, they must keep in mind the overall goals and objectives of the environmental policy when developing and implementing various actions such as environmental impact statements, development of standards, land use controls, and legal actions. Besides this warning, there are two potential problematic consequences which should be mentioned. First, environmental decision makers may believe strategic actions alone will be sufficient and that no further action, strategy or enforcement is necessary. In many ways, it is easier in the political arena to adopt a general policy statement and strategic objective without developing the necessary enforcing actions. A second problem relates to the adoption of various enforcing actions without a policy framework which can serve to provide direction and to integrate the various types of actions into a coherent plan for managing the environment. With these environmental policies in mind, we now can turn to specific actions that local governments can take to manage the environment.

ACTIONS FOR ENVIRONMENTAL MANAGEMENT

After a policy statement is adopted, or in some cases before, there is a need for developing specific actions which will promote the achievement of these goals and objectives. First, is the need for strategic actions which involve the development of programs for improving environmental quality without enforcing procedures. Examples of such actions are a cost benefit analysis of the environmental impact statements, the development of a comprehensive land use plan which outlines the direction for promoting environmental quality, and the development of environmental quality standards. To regulate and promote the strategic objectives and actions, enforcing actions are required. They include such things as economic incentives and penalties, legal action, land use controls through zoning, subdivisions and purchases of lands for greenbelts, monitoring, and other related regulatory processes.

Strategic Actions

Strategic actions, as defined briefly in the preceeding paragraph, are designed to delineate the processes for the achievement of the strategic objectives.

Comprehensive Planning - One of the more traditional strategic actions is comprehensive land use planning. This involves the development of an environmental section in the land use plan which outlines the land use patterns, human environmental perspective, an inventory of the natural resources within the community, and future planned use development which would minimize environmental damage.

In the Anthology, Edward J. Kaiser and others pointed out that the redefinition and reorganization of comprehensive planning to reflect environmental objectives is being accomplished through two different means.* First, many local governments are adding a new section to the total planning program, focusing on the environment and paralleling it to other sectors on economic development, social policy and transportation. Los Angeles added a new segment to the general plan with the intent of it (1) serving as a comprehensive guide for the various governmental and public agencies to identify the interrelationships between the various aspects or dimensions of environmental problems, (2) providing a specific policy recommendation needed for the formulation of standards and legislation relating to environmental quality, (3) presenting guidelines for modifying city procedures in order to minimize negative impact of city operation on the environment, and (4) a comprehensive data source pertaining to environmental factors.

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*Edward J. Kaiser, et.al. "Land use Planning:The Cornerstone of Local Environmental Planning and Control," An Anthology of Selected Readings for the Conference on Managing the Environment, pp. IV-15-19.

A second way in which comprehensive planning is being redefined is in its realignment to exclude the relationships, both supporting and conflicting. Among the objectives of many urban systems are analyses to develop resolutions among them. This directly involves realignment of community objectives of environmental concerns. In Albuquerque, Bernallio county, the County Planning Department published a discussion of community goals within the context of long-term environmental constraints. The first option would require stringent public controls on growth and the modification of current trends in terms of deteriorating environmental quality. The second approach would directly alter the current trends for optimal long-term environmental quality. While the first strategy would call for standards for location and control of development rates, the second strategy would allow for improving land through land development. These two examples of how land use comprehensive planning is changing reflect the planner's increased concerns for environmental quality.

Environmental Impact Statement - A second strategic action which governments can take is the development of a process for assessing the potential impact of projects and programs. This assessment process has taken a number of forms from benefit cost analysis of various alternatives according to their potential environmental damage to impact assessment reports which summarize economic, social and physical consequences of a particular development.

As a result of NEPA the federal government has assumed a leading role in defining and developing environmental impact statement processes. In the last few years, the process for developing and writing impact statements has undergone several sets of guidelines; in fact, the Council on Environmental Quality (CEQ) is now in the process of finalizing a new set of guidelines. In the Anthology, Lyle Sumek summarized some of the major problems in implementing environmental impact statement processes: (1) implementation has been inconsistent with lengthy statements on minor projects and no statements on major programs; (2) the financial costs of conducting the assessment have not been adequately covered; (3) authors of impact statements lack technical expertise; (4) the lengthy period for preparing and writing the statements has resulted in delays and the discouragement of applicants; and (5) the procedure for meeting NEPA requirements has taken precedent over the substantive content of impact statements.*

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*Lyle Sumek, "Environmental Impact Statements: More Myth than Reality," An Anthology of Selected Readings for the National Conference on Managing the Environment, p. IV-51.

In 1970, California passed the Environmental Quality Act of 1970 which directs all local governments to make environmental impact reports on any project they intend to carry out and which may have significant environmental effect. In clarifying some confusing points, the California Supreme Court ruled in Friends of Mammoth v. Board of Supervisors of Mono County that impact assessment reports were required for all public and private projects in cases where local government could be denied approval. The immediate decision of many local governments was to place moritoriums on building permits and rezonings.

One of the first cities to develop an impact statement process was Inglewood, California. Douglas Ayres, City Manager, in describing his city's approach to environmental impact statements during the conference workshop on "Comprehensive Planning", said:

> It seems to us that the analysis of an environmental impact from the physical standpoint such as that done by many jurisdictions was simply inadequate since our particular jurisdiction is in a metropolitan area of some ten million people and has only 93,000 population right in the middle of it. Our control over air, water and solid waste pollution was really pretty much geographically limited as to the way we could control it. Subsequently we developed a review of those subjects on which we could have an impact and called it Total Impact Analysis. (TIA)

The objectives of TIA were to focus attention on existing environmental problems and the generating solutions, to integrate environmental concerns of the community, to broaden the scope of environmental concerns, to improve the public decision making process as it affects the community and to involve community participants in contributing to environmental improvement. In an attempt to assess both positive and negative effects of a particular project, Inglewood developed the impact rating and quantification sheet which lists environmental, social, economic variables which might be affected. In each case, every variable is assigned two numbers: (1) one value reflects the amount (severity) of the impact and (2) another reflects the relative importance of this impact unit as compared to the others. Professional judgment, questionnaires and some forms of group decision making are used to determine appropriate values. Then, these two quantities are multiplied, resulting in impact unit totals for each variable. Next, a dollar value is assigned to each impact unit and this is multiplied by the previous figure to arrive at an estimate of the net social costs and benefits. The comparison of costs and benefits would enable the decision maker to judge the desirability of a project. Thus far, three environmental impact studies have been completed: (1) a sewage site for a water treatment plant, (2) the construction and operating of the plant, and (3) a study of an alternative freeway route. Mr. Ayres admitted that the process was more a way of demonstrating the coordination of effects and programs to various departmental officials than a substantive assessment of environmental impact.

During the same workshop, Robert Einsweiler, a planning consultant, formerly a planner with the Metropolitan Council for Twin Cities, posed the question: Why not an impact statement on comprehensive plans? He pointed out that the project-oriented impact statement process is a weak one, being hampered by a log-jam of statements, a delay near the action phase of a project, a focusing on a limited effect with limited consideration of secondary consequences, not linked to planning and program budgeting,and inadequate treatment or recognition of alternatives. While focusing on a single project, impact statements may be asked to cover the full range of issues surrounding a general policy. While not offering a solution, Mr.Einsweiler pointed out some of the benefits that could arise from having an impact statement on a comprehensive general plan. These benefits included the following: (1) the elevation of the status of land use planning in public decision making, (2) the introduction of greater environmental sensitivity into planning agencies, (3) the elevation of some issues to city-wide, regional, or state issues, (i.e., the urban land use of prime agricultural land in Minnesota), and (4) the familiarity of planners with the objectives of impact assessment, since they are more acquainted with trade-off analysis than the functional agencies responsible for the program. In supplementing Mr. Einsweiler's list, one could add that a less biased assessment would be performed by the planning agency, resulting in less program justification and more appraisal of environmental consequences. Also, a wider range of issues and alternatives may be generated by looking at more policy issues and variables than the ones currently being assessed. The impact statement on comprehensive plans is not without its faults since it would lengthen the planning process.

If an impact statement is written on a comprehensive plan, there may be no need to write impact statements on each individual project or program if it falls in line with the comprehensive plan. However, for projects falling outside or modifying the comprehensive plan, then an impact assessment could be made. This might result in less need for staff, less need for funding for environmental impact statement writing and reviewing. Ultimately, it might lead to a smoother process, one not plagued by delays.

Environmental Quality Standards - A final strategic action which can be used by governments is the development of standards for the quality of the environment. In addressing the issue of standards, an immediate question becomes: who has the authority for developing the environmental standards? During the workshop on "Standards of the Environment," Mr. William Blaser, former director of the Illinois Environmental Protection Agency, pointed out that the issue of environmental standards requires joint responsibility particularly between state and local governments, in order to avoid the confusion and possible conflict due to many levels of government being involved in the process. He suggested that one improvement could be made in management systems by the adoption of an identical standard.

In analyzing the issue of fixed versus variable environmental standards, Robert Pikul, of MITRE Corporation, argued for variable environmental standards with respect to time, space, categories. The major objections to variable standards are that they can result in inequitable treatment of sources; for if your discharge into the environment is being controlled more stringently than a neighbor's, theoretically you will have a higher cost and must be hampered in the marketplace. While this is a vital concern, Mr. Pikul pointed out that the concept of equity ought to be brought into view (more broadly including externalities) - cost of environmental damage. A second objection to variable standards is the complexity in administrative costs. Although it may be true that fixed standards are less costly to administer and enforce, it should be pointed out that the benefits of a variable standard are greater. Environmental managers would be able to adapt the standard for environmental problems in a particular ecosystem. A third objection is the effect on the national economy. Mr. Pikul pointed out that if motor vehicle emissions standards vary from state to state, this would require the manufacturer to adopt a variety of control devices to meet the different standards. It would also affect every citizen if he drove from one state to another with his car not being able to meet the standards of the state he was entering.*

In a proposal to achieve ambient standards for oxidants in southern California, Mr. Pikul pointed out some immediate social and economic impacts of variable environmental standards: (1) increased cost to automobile owners of two hundred to four hundred dollars in initial capital and five to fifteen dollars annual maintenance, (2) increased reliance on carpooling and transit, (3) reduced mobility, (4) a potential cost of income due to decreased mobility, (5) economic curtailment of automotive service and supply facilities, (6) changes in property value, (7) reduced taxes, and (8) potential development of effective rapid transit. The acceptance of variable standards in different geographic locations may also allow people to make a choice regarding where they want to live based upon the risk they want to associate with deteriorating air quality. Mr. Pikul concluded that more analysis is needed before any decision is made.

In developing environmental quality standards, many factors have to be considered: political, economic, and social. But once the standards are developed, then enforcing techniques are needed to assure the compliance with the environmental quality standards as outlined in various public policies of a strategic objective, where a governmental body adopts a policy concerning a specific objective. In developing these standards, Mr. Blaser pointed out the great importance of "people standards." He suggested that people standards are as important as scientifically developed standards since environmental managers must not only look at the chemistry, but also at the sociological and psychological dimensions of the environmental problem.

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*For a detailed discussion, see Robert Pikul, "Fixed Versus Variable Environmental Standards" in the latter part of this chapter.

In interpreting the Clean Air Act of 1970, the Supreme Court ruled that states must maintain air quality at least equal to present level, even if deteriorated quality would still meet federal standards. In a deadlocked four to four vote, the Court endorsed the decision by the Federal District Court for the District of Columbia, which was based in part on a policy of nondegradation of existing clean air and that Congress intended to maintain or lower air pollution levels. The federal government had argued that such strict controls would discourage economic expansion into areas of clean air and possibly inhibit population expansion into previously unoccupied lands. The immediate effect has been to prohibit EPA from approving any state air quality plan that would allow air quality to deteriorate. Prior to the decision, EPA had disapproved all pending state plans since none included assurances that the present quality of the air would be maintained.

Enforcement Action

Once strategic actions are adopted, environmental managers need to have processes and procedures for enforcing or directing compliance. For example, it is not sufficient to develop and adopt environmental quality standards without some means for making sure potential violations are avoided. These enforcement actions can be in the form of direct regulations in which a particular pattern of behavior deemed as being undesirable is prohibited, with violators facing some direct sanction. Good examples of this type of enforcing action would be criminal prosecution, monitoring, and land use regulation. Indirect enforcement actions include goverment monitoring of the discharge of potential polluters, in the hope that monitoring by itself will be sufficient to force compliance.

Land Use Controls - One of the oldest enforcing actions is land use control. During his presentation, Roger Hansen, Executive Director, Rocky Mountain Center on the Environment, pointed to the ineffectiveness of traditional land use controls. He stated that irresponsibility in land use practices due to ineffective land use controls is the basic environmental problem facing the United States. Challenges to the ownership of property are generally resisted through the use of cliches like "every man has a right to use his property as he pleases," or "international communist plot." To understand the ineffectiveness of traditional land use controls, environmental managers need to have some appreciation of their historical development.

As early as 451 B.C., the Roman Codes stated whoever sets a hedge around his land shall not exceed the boundaries; in the case of a wall, he shall leave one foot, in the case of a house, two feet. During the thirteenth century in England the statute of Winchester commanded land owning lords to cut any tree or bush which came within two hundred feet of a highway, so that evil doers could not lurk there. In the United States during the nineteenth century, Massachusetts adopted several land use controls on types of buildings and on the industrial siting.

In terms of traditional land use controls, Mr. Hanson identified three major types of controls: private, legislative, and governmental agency. Private controls involve the unrestricted transfer of a fee for a purpose, conditional fees, trust agreements, easements for scenic and conservation purposes, and restrictive covenants. Their use may be the only effective control in many subdivisions and private developments. Mr. Hanson points out that these controlling devices use little imagination and have minimal flexibility.

The second type of traditional land use control is legislative action, which is generally based on police power regulations such as laws concerning health, welfare, and morals. The police powers in land regulation are realized particularly in zoning, subdivision regulations, building codes, plumbing codes, electrical codes, and other codes. He points out that they have frequently failed because of: (1) an inherent apathy to the dedication of land use without compensation, (2) the unfeasibility of enforcement because of local politics, and (3) conflicts between developers' plans and the comprehensive plan. Enabling legislation inhibits development of new planning ideas. His final point is reinforced by the fact that Colorado made planned unit development illegal in thirty counties.

A final type of traditional land use control is control by governmental agencies. Since one-third of all land in the United States is federally owned, various administrative agencies at the federal level find it very easy to control the development and use of those lands. Government ownership of streets, parks, forests, recreation areas and Indian Reservations allows for controlling their use and development. In addition, the use of eminent domain (taking land for public purposes with compensation), is usually used for highways, but rarely for parks, wildlife refuges, and other environmental programs. Urban renewal applies only to particularized local urban areas, generally those where a severe blighted condition exists. The health boards or pollution control agencies operate through the use of variants rather than strict compliance to any strategic objective.

Only recently, local governments have begun to develop new land use control mechanisms such as the requirement of large lots (forty acres) and the establishment of growth limitation permits. The legality of some of these new controls is presently being tested in the courts. For example, Ramapo, New York, amended its zoning ordinance to create a new special permit labeled the Residential Development Use. Anyone wanting to use the land for residential development needed a special permit. It was granted only when standards were met for the new development. The new ordinance was vigorously attacked by land owners who claimed a destructive value on the marketability of their property. In addition, this new ordinance was a marked departure from the traditional development of the city which thought that private investing comes first. This case ended up in the New York Supreme Court where the Ramapo ordinance was upheld. All judges agreed that they were in opposition to using zoning ordinances for exclusionary purposes and that there was a positive role for the state in land use matters. However, the majority opinion pointed out that there is an antiquated notion that regulation of land use development is uniquely a function of local government. Ramapo, in acting on its own, developed reasonable procedures for appeals and variances which would show developers how to plan for phased growth. The court decision in effect told the state legislature to provide new approaches to guiding land development and to become an active participant in land use controls.

In his presentation Mr. Hanson pointed out that states are beginning to realize the importance of their role and to impose some forms of land use controls. He cited several examples: (1) Colorado and Oregon have adopted stringent requirements for local subdivision regulations; (2) states are acquiring authority over land use, such as Maryland's control of the siting of industrial facilities and California's, Maine's, and Delaware's controlling land use in the coastal zone; (3) the preemption of local governments to act in coastlines has evolved in Georgia, Michigan and Wisconsin; (4) Hawaii has adopted a two-tiered zone system; zoning by state of all lands into urban, rural, agricultural and conservation categories with local zoning involving commercial and light industry within gross state areas; (5) New York and New Mexico have tied capital expenditures such as airports and water facilities to land use planning; (6) Vermont has adopted a system of regional bodies controlled by the state with the responsibility of making major land use decisions; and (7) New Mexico and Vermont have established regional planning commissions and a state commission with veto power over land use decisions. Mr. Hanson concluded that it is clear that state governments are giving up on the ability of local governments to make and enforce sound land use decisions.

At the present time, numerous new strategies for land use control are emerging. The foundation for these new mechanisms is the development of some form of environmental inventory which identifies and analyzes critical environmental factors. The resulting information will provide a scientific and legally defensible data base for future land use controls. Mr. Hanson outlined a system of environmental resource inventory analysis. The system identifies and analyzes major elements of the ecosystem such as climate, geology, land form, surface, water, botanical and zoological life, and historical, cultural and present land use. This analysis provides an in-depth systematic look at the current status of the environment.

Since it would be impossible to identify all major innovations in land use control, Mr. Hanson listed the following; the first innovation would be the development of state-wide zoning which classifies land into zones on a state-wide basis. This provides a broad view of land use which takes zoning out of the local political environment, where controls have been fairly weak and ineffective. A second new action would be the development of federal land use commissions which would identify "federal land use decisions." They would provide grant-in-aid programs to improve land use planning and management at the state level, and be able to force states to inventory land use resources and develop a state-wide land use plan. The third innovation would be a program of public education indicating land use patterns as a major source of our environmental problems. It would involve educating the public that land use controls are profitable and that greater stability, greater efficiency, and less taxes would result. Another innovation would be class action suits in which an individual would be permitted to go to court opposing governmental and other decisions on land use in an attempt to show personal injuries. A fifth action would involve the licensing of realtors and subdividers, registration of subdivisions, and public disclosure statements which would require that a subdivider not only build a house, but consider a broad view of the impact of his subdivision on the environment.

A major function of state and local governments is the development of a planning process to prevent the impairment of the environmental quality. Land use controls can be an effective means in the fulfillment of this function. These controls can be used to enforce environmental quality standards, growth limitations, and comprehensive planning.

Legal Action - A second enforcement action is legal suits. Before legal actions can be initiated, a sound body of environmental laws and regulations must exist. Over the last thirty years, legal requirements have developed tremendously as evidenced in air pollution which has progressed from smoke codes to sophisticated emission standards, designed to reduce automobile emissions by ninety percent. The focal point has shifted away from early state and local laws based on the states' police power to the assumption of greater responsibility by the federal government. Federal laws such as NEPA, the 1970 Clean Air Act, and the 1972 amendments to the Water Pollution Control Act provide the necessary frameworks for legal action.

However, the passage of these environmental laws does not mean that the programs will be properly administered or effective. In the Anthology, Joseph Sax stated that:

> It may seem ironic that courts are needed to help make the legislative process work effectively; that citizens must come to the least democratic of the branches of government to make democracy work. But that is one of the intriguing questions now being explored under the label of environmental litigation.*

During the workshop on legal action, Frank Grad, School of Law, Columbia University, elaborated on this point when he commented that the law and legal developments in environmental protection have only gone as far as our governmental willingness to enforce them. He claimed that legal action has been a major generating force in strengthening both strategic and enforcement actions.

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*Joseph L. Sax, "Emerging Legal Strategies: Judicial Intervention," The Anthology of Readings for the National Conference for Managing the Environment, p. IV-86.

Although there are many issues related to legal action, two major ones emerged from the workshop. The first issue is the "standing doctrine." In the past, the court has been reluctant to allow members of the public to sue since there was a fear that this would result in a plethora of crank suits. Although cases like the Sierra Club v. Morton have resolved standing, Mr. Grad pointed out that the Water Pollution Control Act gives only those with an "interest" the right to intervene rather than "any citizen," as under the Clean Air Act of 1970. Another aspect of standing is to confer rights to some new entity such as nature. In the United States, legal institutions are generally resistant to giving things "rights" until they can be shown to have a value for themselves, as demonstrated by the lengthy period of time it took for the southern slave to obtain his rights. In a recent article Christopher Stone argued that:

> ... the environment should have rights is not to say that it should have every right we can imagine, or even the same body of rights as human beings have. Nor is it to say that everything in the environment should have the same rights as every other thing in the environment.*

In analyzing the legal dimensions, Mr. Stone argued that courts should be compelled to show how environmental damage was calculated and how heavily it was weighed. Two positive consequences would result: (1) it would shift the focus of courtroom testimony and concern; and (2) the appellate courts through their review and reversal of insignificant findings would build up a body of environmental rights. He pointed out that the Supreme Court may find itself in the position to award rights in a way that will contribute to a change of popular consensus. It would be a move that would further develop environmental strategic objectives and actions.

A second issue is the use of police power. In his presentation, Henry Lord, Deputy Attorney General, State of Maryland, argued that the states are well equipped to deal with environmental problems. As the federal government has increased its involvement in environmental management, the police power of the states has been questioned. He pointed out that the Supreme Court in American Waterways Operators v. Askew has recently recognized, in an unanimous decision, this problem and resolved it in a way that gives state officials wide powers to protect natural resources which they hold in trust for the citizens. He also argued that state interests take precedence over local interests, since states are better at balancing the interjurisdictional environmental costs and benefits. He cited the wetland as an area where the counties saw its value in terms of dredging and filling and not of conservation or preservation of natural resources.

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*Christopher D. Stone, "Should Trees Have Standing? - Toward Legal Rights for Natural Objects," Southern California Law Review XLV (Spring 1972), pp. 457-8.

During the past few years, particularly since NEPA's enactment, the volume of city initiated suits in the courts has increased rapidly. These suits have attempted to open decision making to citizen input and to force compliance to laws and administrative regulations. Since the topic of citizen suits has been addressed in an earlier chapter on citizen participation, the topic will not be repeated. However, the development of public interest law firms such as the Environmental Defense Fund (EDF) and the Natural Resources Defense Council should be discussed. In initiating many suits during the past few years, they have come to play a leading role in determining and clarifying environmental law. Mr. John Dienelt, Environmental Defense Fund, described the goal of his organization as being to insure that the environment is considered in administrative policy decision making. They have a staff of scientists which review every case before it is taken into court, to determine the technical correctness of their information. The EDF sees litigation as a means to an end in which there is co-equal participation in public governmental policy making and decision making, particularly in the area of the environment. The firm's effectiveness in legal action is vividly demonstrated in the development of the federal environmental impact statement process through the Calvert Cliffs and Kaber decisions. Their desire is to decrease the use of legal action as administrative organizations become more and more responsive to environmental needs and desires.

Since industry has become a common defendant in environmental law suits, private corporations have become active in environmental law. In discussing their development, Everrett H. Bellows, Vice President of the Olin Company, stated that corporations need to mobilize their total resources to deal constructively with environmental issues. He pointed out that Olin's environmental resource council was organized to provide coordination within the company and with the sponsors of conferences for middle management. He concluded by pointing out that industry has an obligation to appeal unfair environmental decisions. They may go to court to resist arbitrary and uninformed judgments, and to prevent such judgments from being translated into environmental standards and regulations that could not be enforced because of technological limitations or environmental costs.

Since heavy caseloads in the courts have resulted in lengthy delays, many cities are in the process of developing their own procedures. During the workshop on legal action, Mr. Norman Redlich, Corporation Counsel, New York City, pointed out that they have attempted to take two procedures to supplement normal legal action.

First, they have created an environmental control board which attempts to take many cases out of the court system and place them under the jurisdiction of administrative agencies. This board has been granted authority to issue cease and desist orders, revoke operating permits, and impose civil penalties up to $100 a day for each violation. The city is working for state legislation to absolve the court proceedings and judgments and to grant judicial review only in cases in which the imposed penalty was arbitrary or capricious.

A second technique developed in New York City is the citizen complaint technique, where citizens are encouraged to file a complaint with the environmental control boards, alleging code violations. The Environmental Protection Agency then has the option to prosecute. If this initiative is not taken by the agency, the citizen then can prosecute on his own through the courts. A sliding bounty system was initiated in which a percentage of recovery fees was granted to the reporting citizen. An even higher percentage was granted if the citizen went to court after an agency rejection. This system has proven rather controversial.

Thus, legal actions have become extremely important in the enforcement of strategic environmental objectives. In addition, the development and effective administration of other enforcement actions, such as land use controls and moratoriums, have to depend to a degree on clarification and interpretation in the courts. It is important to realize that the resolution of legal issues may determine the evaluation of environmental management.

Economic Incentives and Penalties - A third enforcing action is the use of various incentives and penalties in residual management. Although this topic was not directly addressed at the Conference, various examples such as the tap charges for connecting water and sewer lines, or the sewage discharge surcharge were discussed in several workshops.

Traditionally, environmental enforcement programs have employed the utilization of economic incentives which are designed to incite action. For example, the Federal Water Pollution Control Act of 1965 financially supported municipal wastewater treatment plants, through the authorization of $3.4 billion for such grants. Industry has also received funds for the improvement of pollution control equipment and tax write-offs for the adoption of environmental programs. However, economic incentives are ineffective in bringing the social and environmental costs of production into pricing and curtailing the inefficient use of natural resources. In addition, subsidies for the construction of sewage treatment plants do not by themselves provide an incentive to take action for control of waste discharges. Even if government and industry were to pay a major portion of the cost of the waste treatment plant, it is cheaper from their point of view to dump the untreated waste into the river. Thus, subsidies cannot work under this type of arrangement unless they are accompanied by some other enforcing action.

As an alternative to incentives, effluent charges are based on the assumption that since the environment is common property, any person or organization causing environmental damages must pay. These payments are based on the amount and content of the waste discharged. Hopefully, the charge would be sufficient to force improvement in the quality of the discharge. In addition, effluent charges are presently being defined by many governments in terms of sewage surcharges and penalty fees. In the Anthology, Allen Kneese outlined a national water pollution program based on an integrative water quality plan and the development of a charge system.* He pointed out that the strengths of an effluent charge are: (1) the final price of a product reflects the producer's cost of treating his waste and results in products from polluting activities being more expensive in the marketplace, (2) to reduce production costs, the producer adopts new production mechanisms and technologies for waste treatment, and (3) the effluent charge increases tax revenues.

Although the potentiality of effluent charge as an effective enforcement action is high, the feasibility of widespread development is low. The industries' opposition stems from their feeling that the charge is a punitive action and that it is unfair for them to pay for the residuals from waste discharges. They also argue that funds expended for charge payments could go into new pollution abatement equipment or research. Industry realizes that this charge is nearly unavoidable and unevadable.

From a different perspective, some environmental groups label the effluent charge a "license to pollute" since there is no total prohibition of all discharges. More sophisticated monitoring devices need to be developed to make accurate measurements of the quality and quantity of the discharge.

Other Enforcement Actions- Two additional enforcement actions which have been used by environmental managers need to be mentioned. First, enforcement conferences have been widely used in federal water pollution control programs. These conferences are presently called by the Administrator of EPA to bring all interested parties together in order to discuss and develop potential solutions to environmental problems. The government must rely on the participants for all information regarding alternative actions. Although cases may ultimately end up in the courts, the effectiveness of enforcement conferences has been plagued by delays and an unwillingness to convene such meetings. A second action is the use of moritoriums by local governments. The adoption of moritoriums on land development and rezonings is common in growth control. The legality of this action has varied from case to case.

CONCLUSION

This chapter has attempted to provide some framework for understanding the complex relationship between environmental policies and the differing programs and techniques for their implementation. The "state of the art" in environmental management is in an embryonic state, with new actions being developed and tested in a variety of environmental contexts. No single environmental policy or specific action is going to work in all environments. Political, social, and economic factors along with insufficient ecological knowledge will limit their effectiveness. In order to aviod working at cross purposes, environmental managers need to develop a comprehensive environmental policy along with a plan for implementation which integrates the various actions.

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*Allen V. Kneese, "Strategies for Environmental Management," An Anthology for the National Conference for Managing the Environment, pp. IV - 53-59.

THE CONCEPT OF CARRYING CAPACITY

A. Bruce Bishop, Richard Toth, A. B. Crawford, and H. H. Fullerton*

REGIONAL GROWTH AND CARRYING CAPACITY -- AN OVERVIEW

The capacity of natural and human environments to accommodate or absorb change without experiencing conditions of instability and attendant degradation is a significant concern in view of current trends of urban growth and development. The ability of the environment to sustain particular levels of activity may already have been exceeded in some areas and, in others, resource management options are rapidly being foreclosed. In the face of these changing conditions, a phrase heard more and more frequently is carrying capacity. As a developing concept for regional environmental management, this paper examines carrying capacity as an approach to understanding and analyzing the ability of the environment to absorb or support activities of urban and regional growth.

Virtually every urban center faces problems of accommodating some degree of future development. In managing the environment for quality regional growth, questions related to the carrying capacity of environmental resources lie at the heart of the problem. Two brief examples from the Wasatch Front area of Northern Utah serve as good illustrations.

The Ogden Valley, situated five miles east of Ogden, Utah, is basically a rural agricultural valley of roughly fifty square miles, with a total population of about 1,000, residing in three small communities. The canyon is an important recreation resource offering excellent fishing and camping by the river which flows from the valley watershed and the Pine View Reservoir. The Ogden Valley offers extensive recreation opportunities for residents of the urbanized Ogden and Salt Lake City regions. The reservoir is a major water-based recreational area offering swimming, boating, and fishing. In addition, golfing, picnicking and camping facilities have been developed in the Valley, and two major ski areas on the mountain slopes serve the winter recreationists. Upland and mountain wildlife species abound in the Valley and the surrounding mountain forest areas. There are a number of proposals for large developments in the Ogden Valley and lower mountain slopes, including vacation resorts, condominiums, lower density summer home developments, and housing tract developments for bedroom communities for the urban areas. The Highway Department is considering plans for major improvements in access to the Valley. In the face of the mounting pressure for development, without a comprehensive analysis of the carrying capacity of the Valley, there may be serious and irreversible damage to environmental resources. Some of the issues related to carrying capacity are:

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*Presented by A. Bruce Bishop, Assistant Professor of Civil and Environmental Engineering, Utah State University, at the National Conference on Managing the Environment.

> What is the capacity of the reservoir and the river downstream to maintain the natural water quality levels and continue to support existing ecosystems?
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> What is the capacity of soil to resist erosion from intensive recreation or development use?
>
> What is the capacity of the valley to provide infrastructure for development -- water supplies, wastewater disposal, solid waste disposal areas?
>
> What capacity constraints are imposed by the existing transportation system? What will be the effects of the increased capacity of the proposed high speed access?
>
> What will be the impact of air quality conditions with increased traffic and housing and commercial development?
>
> What plant and animal species will be displaced, and what is the capacity of the ecological systems to absorb changes from development?
>
> What is the capacity of the Valley to serve as an open space and recreation resource?

The canyons immediately above the Salt Lake City are also being subjected to intense pressure for development. These canyon watersheds supply most of the water needs for the Salt Lake Valley. They also provide an outstanding recreational resource for winter skiing and summer mountain outings and vacations. Large resorts have already developed in the canyons to serve recreation interests with proposals for many new resort hotel and private summer home developments. Questions relating growth and carrying capacity are:

> What is the capacity of the fragile watersheds ecosystems to support various intensities of development and recreation use?
>
> What is the capacity of air and water resource systems to absorb the pollutants from these developments?
>
> Can a transportation system of adequate capacity for the

development be constructed without complete disruption of the canyon ecosystem?

What user-capacity can the recreational areas accommodate and still provide a satisfactory experience?

These examples illustrate the need for technical knowledge about the capacity of the environment to accommodate growth.

The carrying capacity concept implies understanding the regional environment as a support system for numerous, interdependent and competing activities and systems, and determining the limiting conditions and capabilities of the regional environment to absorb, withstand, support, or sustain these activities without causing unacceptable changes in environmental quality.

CARRYING CAPACITY -- A TOOL FOR ECOSYSTEM MANAGEMENT

From the standpoint of ecosystem management, the term "carrying capacity" is used in terms of the biological or physical relationships between a given resource "stock" and its maximum sustained "yield." Specifically, it is interpreted as the maximum number of individuals of a species that can be supported by a given habitat under various conditions of stress. The general implied goal is to maximize the productivity of the system, subject to the constraint of non-impairment or non-degradation of the supporting ecological system.

In this context, carrying capacity is a working concept with a long history in resource management. In the management of range-land resources, the concept is inherent in the limitation of livestock numbers according to available forage and water. A range-land is said to be stocked at its carrying capacity when a given number of animals with known daily nutritional and water requirements is in equilibrium with or does not exceed the actual land productivity or forage and water on a sustained yield basis. The consequence of exceeding carrying capacity is a downward trend in range conditions. In forest resource management, the concept is applied in terms of harvesting only the net annual increase in board-feet of timber produced on the forest on a sustained yield basis so that the overall total board-feet of timber is constantly maintained.

CARRYING CAPACITY IN THE URBAN-REGIONAL CONTEXT

Thus far, the concept of carrying capacity has mainly been used and applied in relation to ecological systems. Many of the difficult problems of environmental management, however, arise in the urban-regional context. Since urban systems interface with natural systems, and since natural systems are a part of urban systems, the interpretation of the concept of carrying capacities in this setting is receiving growing attention.

ECOLOGICAL AND URBAN SYSTEMS: SIMILARITIES AND CONTRASTS

There is increasing interest in an interdisciplinary approach to the study of urban systems and ecological systems (urban ecology). Holling and Orlans (1971) note that urban and ecological systems share four common characteristics:

(1) a historical property, since both respond to present and past events;

(2) a spatial property, since they respond to events at several different points in space;

(3) a systems property, since both encompass many different component activities with complex feedbacks and interactions; and

(4) a structural property, since they both exhibit characteristics of lags, thresholds and limits.

The second, the third, and particularly the fourth property point toward the potential usefulness of carrying capacity in the urban setting.

The American Association for the Advancement of Science symposium on urban ecology (1970) indicated that "like other man-dominated systems, the city is an unstable, highly productive, but poorly buffered system consisting of relatively few species and dependent on a large input of energy and materials. The city may be viewed as a detritus ecosystem in which all fixed energy originates outside its limits and from which large volumes of waste materials and diffused energy escape to the detriment of other systems." This emphasizes the interrelationship between urban and the surrounding non-urban area as urban sprawl and high mobility bring the contiguous agricultural and natural resource areas within the supporting resource base for urban activities.

The implications of carrying capacity concepts appear important for analyzing urban regional growth in terms of efficiency of energy and material transfer, handling of wastes and byproducts, and as support system activities influenced by succession, energy flow, population dynamics and territoriality. Holling and Orlans (1971) summarize these ideas by stating that "it appears that we are quickly reaching the point where environmental limitation will inevitably impose constraints on urban systems."

DOMAINS OF CARRYING CAPACITY FOR AN URBAN REGION

In extending the concept of carrying capacity to examine the capability of a region to sustain existing and proposed activities, consideration must be given to the character and extent of the resources, functions, and structures of urban areas which circumscribe the domains for carrying capacity in a region. The environmental planner and manager must understand such questions as: What are the relevant environmental resource components? How do they function? How do they interact with and influence other components, or conversely, how are they influenced by other components? What factors control levels of environmental quality and how do proposed activities affect those factors? The function and structure of urban environmental resources and their interactions with one another, then, are essential to specifying the domains of environmental carrying capacities for urban regions.

Resources from an urban perspective

Traditionally, resources have been understood either as elements of the natural environment or as inputs to economic production. In urban areas, where much of the living environment is essentially man-made and serves as a means of organizing man's activities, our definition of resources and related environments is too narrow. For urban areas, rather than sticking to the usual land (with associated mineral deposits, forests, etc.), water and air delineations, the description of urban resources environments (Perloff, 1968) might be elaborated along the following lines:

Ambient resources:	airshed, watershed, open space, quiet and noise zones, sunlight exposure
Spatial resources:	underground space, available and transitional surface space, airways space
Infrastructure and distributive resources:	transportation, water and water distribution, wastewater collection, energy (electricity and gas) distribution, communications
Ecological resources:	green plants, non-green plants, animals
Socio-cultural resources:	educational and cultural facilities, health services, security services (fire, police), recreation services, housing stocks
Economic resources:	raw materials for production inputs, capital, labor
Amenity resources:	seashores, scenic areas, contiguous natural areas (mountains, deserts, lakes), open space

Some of the attributes or characteristics of these classes or types of urban resources which enter into an assessment of their capacity to support a particular activity or changes in sets of activities are:

(1) Quantity and quality: Quantity and quality are two resource attributes inextricably connected in relation to carrying capacity for a particular activity or use (e.g. volume of water of quality for drinking, or for cooling; space available for movement of vehicles, or for construction, or for open space).

(2) Renewability: The quantity and quality of a resource is, in turn, closely related to its characteristics of renewability on non-renewability. Stock resources, such as mineral deposits, fossil fuels, and available land, are essentially fixed in quantity and, in that sense, non-renewable. The capacity of such resources for supporting urban systems, therefore, depends on rates of use or exploitation, the possibilities for salvage and recycling or the development of substitutes. Naturally renewed resources (natural vegetational and animal growth) and flow resources (solar radiation, and natural cycles for water and other elements) have renewable characteristics in which process rates determine the quantity and quality available in a given time period. Capacity of renewable resources depends on the care and efficiency of man's intervention in the use of the resource without upsetting or destroying the natural processes which assure availability of the resource.

(3) Spatial distribution: Spatial distribution is related not only to resource location, but also to identification of the resources which are part of the urban region itself. Drawing boundaries around the urban region in order to circumscribe geographically the resources which contribute to its carrying capacity may be a difficult and sometimes arbitrary task. Electrical energy, water and fossil fuels are often situated large distances from actual centers of urban activity. Should they be considered as external or imported resources? This question raises the broader issues of environmental quality relations between areas of resource extraction or production and areas of resource use. The concept of carrying capacity recognizes that the interface between the city and non-urban areas has become more explicit, particularly in the couplings established through resource development, energy production and transfer, pollution outputs, and deterioration of contiguous agricultural and recreation lands due to urban sprawl.

(4) Economic and social costs: The classical concept of common or "free good" resources has little validity in terms of carrying capacity for sustaining regional activity and growth. There is now a high value associated with maintaining the quality of ambient resources such

> as air and watersheds. The industrial firm dumping wastes directly to a stream, airplane flightpaths over residential areas, the individual automobile adding to congestion and air pollution, and the building that blocks out the sun are all examples of individual actions contributing to a deterioration in environmental quality for the entire society. What levels of activity in use of common resources should or may be permitted is certainly a question associated with the carrying capacity concept.

A description of the urban "resources" compatible with aspects of urban environments may provide a structure for determining how growth, as measured against resource capacities, will affect regional environmental quality.

Urban activity-systems and linkages

Superimposed upon the mosaic of social, economic and ecological resources of a region is the domain of urban activity systems and their linkages. The composite of urban activities, both public and private, contributes to a set of regional outputs which enhances the quality of life. Urban activities are linked and supported by the infrastructure and resource distribution systems of the region, transportation, water distribution, and energy distribution. The current capability of the infrastructure and the resources they distribute to sustain activity are a key aspect of the "carrying capacity" of an urban region, and represent short and medium run constraints on regional quality growth.

People and institutions

People and institutions represent the third important domain of carrying capacity for urban centers. Institutional and individual values, as reflected in present or desired life-styles of the residents of urban areas, should have an important influence in determining quality aspects of regional growth.

CARRYING CAPACITY IN THE ANALYSIS OF REGIONAL QUALITY GROWTH

To translate the broad concept of carrying capacity into a useful tool in achieving quality regional growth requires answers to the following questions: What will be the demands on the environment as a support system relative to the quantity and quality of available resources? At what resource and quality levels will the environment as a support system fail? How do changes in an activity affect the environment's capability to sustain other current activities or new developments and activities? What measures would be most useful in analyzing environmental carrying capacity? Exploring the concept of carrying capacity as related to quality regional growth will hopefully provide a structure for answering these questions.

URBAN-ECOLOGICAL STRUCTURE AND REGIONAL QUALITY

The concept of carrying capacity is useful only as it enables the environmental manager to assess and evaluate the impact of various proposals on regional environmental quality. In making such judgmental decisions, carrying capacity is related to two important qualities of ecological and urban systems (Holling and Orlans, 1971).

Stability in ecological and urban systems is due to the existence of damping forces that tend to move the systems towards an equilibrium state. However, since the equilibrium changes continuously with time, the importance of stability is with reference to the structure of the system.

Resiliency is a measure of the limits of stability of the system. If transients shift elements of the system beyond domains of stability, then radical change occurs. The concept of resiliency encompasses the idea that incremental changes may be absorbed, but cumulative effects of small changes might reduce overall system resilience.

Again, Holling and Orlans (1971) stress the need to understand "the complex nature of tradeoffs and limitations in options and resilience that characterize systems operating close to the carrying capacity of the environment."

DIMENSIONS OF CARRYING CAPACITY

Working from these basic notions in carrying capacity, Figure 1 illustrates some of the dimensions of carrying capacity and suggests that a determination of carrying capacity is based on an understanding and analysis of both limiting factors and trigger factors.

The limiting factor is an environmental factor which limits growth, reproduction or resource use of an individual, community or activity either physically or behaviorally.

The trigger factor is a new or changed environmental factor which sets off a chain of events in an ecological or urban environmental system.

The carrying capacity of a system then may be described by the limiting factors and trigger factors which are operationally significant, i.e. those factors which effect a decline in some valued aspect of regional environmental quality. Three general dimensions of carrying capacity are appropriate areas for analysis of limiting and trigger factors as related to urban resources, structure and activity:

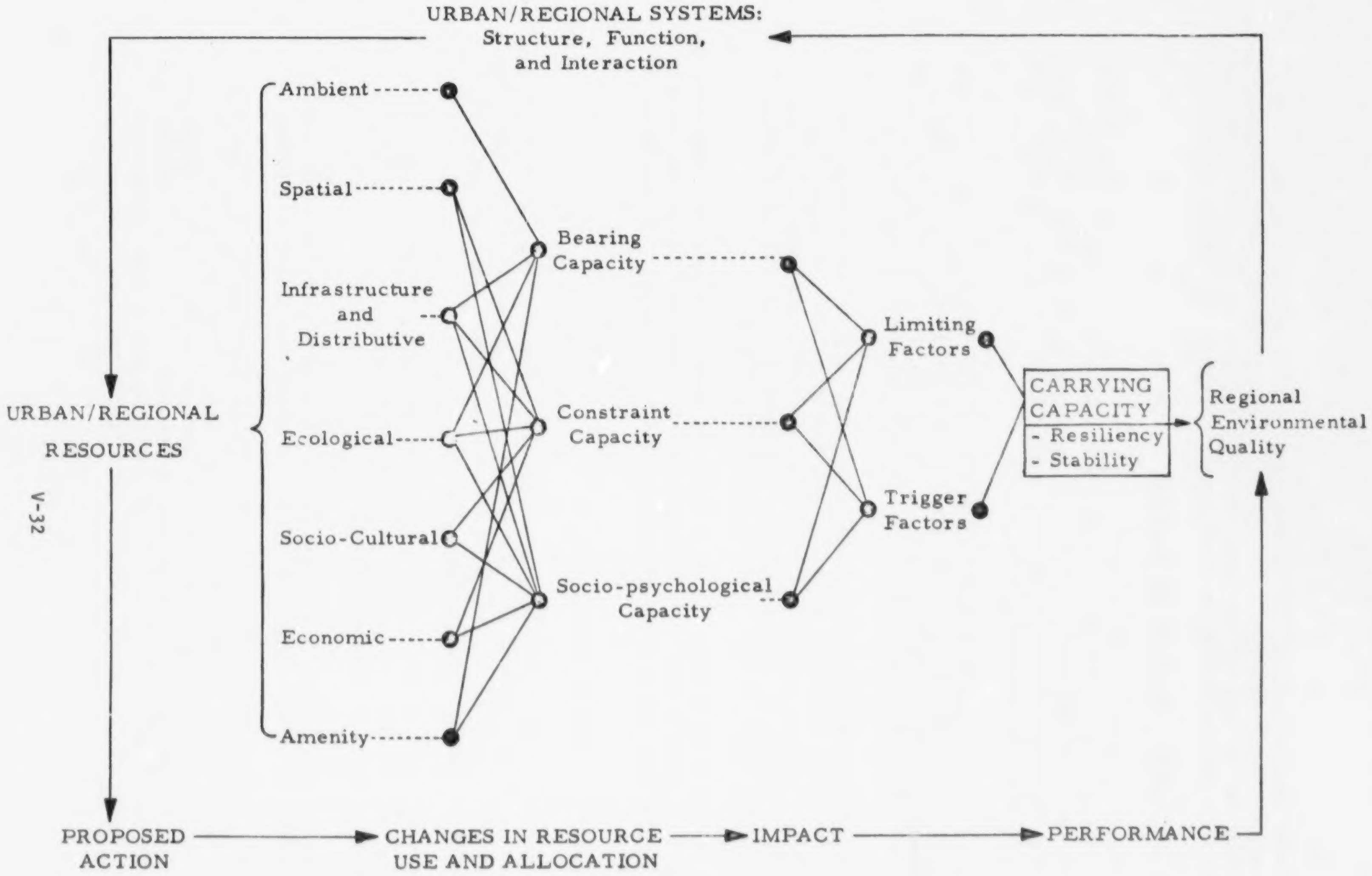
URBAN/REGIONAL SYSTEMS:
Structure, Function, and Interaction
URBAN/REGIONAL RESOURCES
Ambient
Spatial
Infrastructure and Distributive
Ecological
Socio-Cultural
Economic
Amenity
Bearing Capacity
Constraint Capacity
Socio-psychological Capacity
Limiting Factors
Trigger Factors
CARRYING CAPACITY
- Resiliency
- Stability
Regional Environmental Quality
PROPOSED ACTION
CHANGES IN RESOURCE USE AND ALLOCATION
IMPACT
PERFORMANCE

Figure 1. Overview of carrying capacity relationships.

Resource bearing capacity

Resource bearing capacity is basically a biological and resource flow definition. Capacity is examined in terms of the levels or input rates for an activity that can be withstood by the biota or the resource flow systems and still return to an unimpaired state. Essentially, this suggests a non-impairment criterion for establishing levels of use which can be sustained for an indefinite period of time without altering or degrading the resource. The underlying objective, then, is achieving a maximum sustained yield for a given activity. The important factors in analyzing resource bearing capacity are the ability of the resource to produce the kinds of services required, and the ability of the biota or flow system to recover after peak use; for example, the ability of air and water to assimilate certain pollutant waste loads over a period of time without deterioration of ambient quality conditions.

System constraint capacities

System constraint capacities are concerned more with the physical limits of resources or of resource processing and use systems. The former would be considered in terms of non-renewable stocks or resources such as mineral deposits, fossil fuels, and available land (in the short and medium run), and the rates at which such resources are being developed and used. The capacity for use of both non-renewable and flow resources may also be limited by the capability of the present system to process and use them. For example, a certain forest area might be producing a net annual increase in timber which is greater than can be harvested on a sustained yield basis because of its inaccessibility from the current transportation system. The objective indicated by this definition is efficiency in resource use and in the management of resource processing systems.

Social capacities

Social carrying capacity is related to the overall levels of satisfaction experienced by users or other affected individuals resulting from resource management practices. Social capacity is stated in terms of maximum number of use-units (e.g., people, vehicles, etc.) that can utilize available resources during a specified period of time for one or several activities, while providing a satisfactory experience for the users. The operationalization of this goal in determining a "satisfactory experience" might be to maximize the total user satisfaction. Before determinations may be made about levels of "satisfactory experience," the kinds of experience the resource is expected to provide must be established. A particular resource or group of resources may be capable of providing for several different types of activities. Some of these activities will compete for the resources, while others may be compatible. Inevitably, this will require management decision about which resource use or combinations of uses will be pursued. Examples include whether a particular tract of land should be managed for wilderness recreation or developed with access roads and recreation facilities, and whether a particular tract of urban land should be zoned and managed as open space or for various kinds of residential and commercial development. When deriving a set of management objectives, one must consider the feasibility of the objective in terms of resource bearing capacity and system constraint capacities.

The aspect of "satisfactory experience" or user satisfaction is a function of individual attitudes with respect to the management objectives in question. For example, "How many people can be handled in a wilderness area at one time before the wilderness experience is lost?" or stated another way, "What number of people maximizes the total satisfaction in the use of the resource for a wilderness experience?"

The quantitative application of this criterion in determining optimal capacity of resource based recreation facilities is discussed by Fisher and Krutilla (1972). A brief review of their example will provide a clearer picture of the idea of social carrying capacity. Figure 2 depicts a special set of aggregate demand schedules. The horizontal axis represents recreation intensity, i.e., the number of recreationists per unit time. The vertical axis represents quality of the recreation experience as measured in some unit of satisfaction (this could be a price in dollars consumers were willing to pay for a given quality of experience). For ease of explication, assume a family of demand curves each one valid over a certain range of recreation intensity. Moving from bottom to top, each curve represents a higher quality experience due to slightly lesser intensity of recreation use. Thus the level of satisfaction as measured by the willingness to pay is higher. From these demand schedules the intensity of recreation activity which achieves the maximum level of satisfaction can be deduced in the following way: The total satisfaction for recreation intensity of q_1 is the area under the demand curve DD_1'. If we move to a level of intensity q_2 there is a gross gain in user satisfaction of the area under the x_1D_2' portion of the curve DD_2', but also a loss of satisfaction represented by the area $D_1D_2x_1D_1'$. The net gain in user satisfaction is therefore the difference of the two areas. We can continue to achieve increases in user satisfaction by increasing intensity, as long as the net gain from higher intensity use is positive. The point at which the net difference becomes zero is interpreted as the optimum capacity since moving beyond this point results in a decline in total satisfaction. This may be seen graphically by plotting the total and marginal benefit (stated in units of user satisfaction) curves as shown in Figure 3.

The example illustrates limiting factors in determining carrying capacity from the standpoint of individual and social values and behavior. Our perception of the quality of the environment in which we move, work, and play, and the environment's capacity to sustain these activities at "satisfactory" levels is closely related to the levels of social stress and congestion costs experienced by the user.

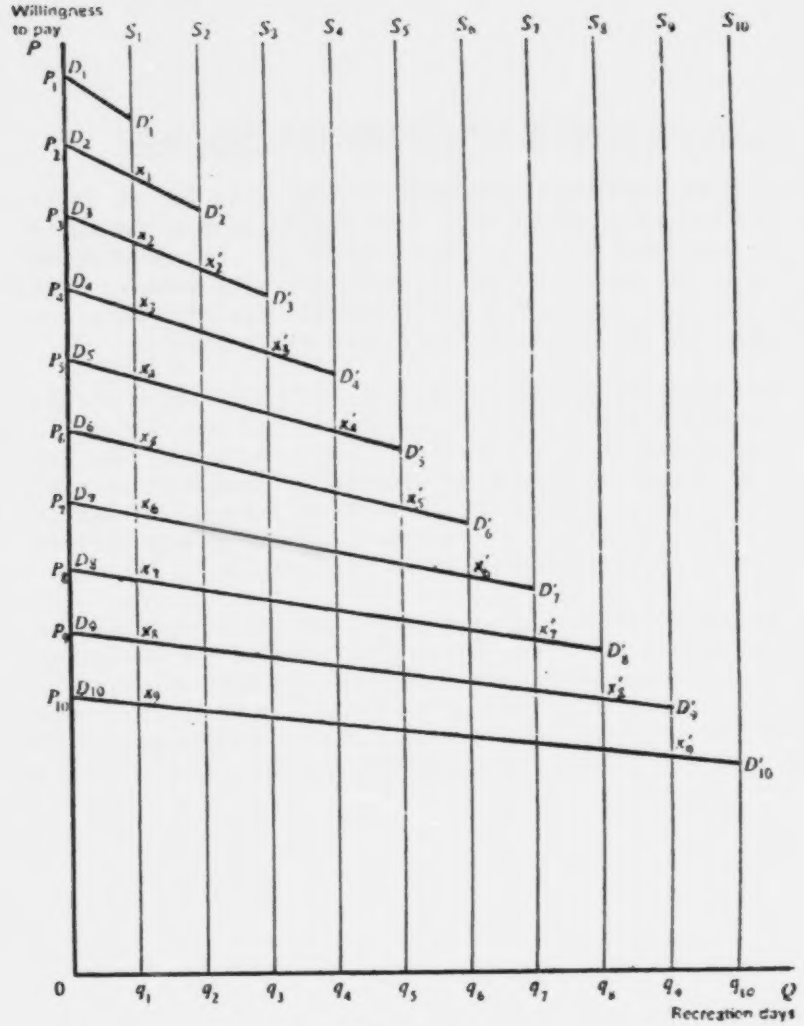

Figure 2

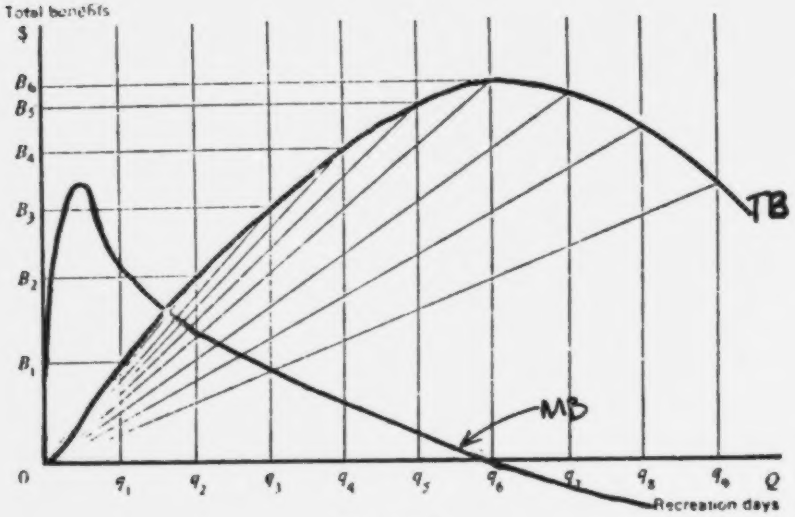

Figure 3

CARRYING CAPACITY AND ENVIRONMENTAL MANAGEMENT

In developing environmental management strategies for an urban region, planners and decision makers must continually assess the social and environmental implications of various proposals. Recognizing and establishing the limits of capacities of regional activity support systems along the dimensions described above could provide decision makers with a workable approach to assessing the impact of proposals.

Indices have begun to develop as a means of providing a working knowledge of environmental quality and of charting trends and changes in quality levels. The development of carrying capacity concepts may extend the usefulness of these indicators to provide for comparative evaluations of environmental quality dimensions in terms of ranges and limits of acceptable levels, and the impact of various regional growth policies, rather than merely the presentation of trend information.

Regional environmental management models which incorporate the concept of carrying capacity may thus be used to examine the character of changes that will occur under different levels of activity and types of use, whether such changes are within acceptable limits of environmental and social carrying capacity, and the ways predicted changes in the physical environment relate to the social objectives and values for resource use.

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FIXED VERSUS VARIABLE ENVIRONMENTAL STANDARDS

Robert Pikul*

INTRODUCTION

The established nature and enforcement of environmental standards will have a far reaching impact on future socio-economic-environmental characteristics of geographical areas, availability and cost of energy, revitalization of urban areas, and overall quality of life.

Environmental standards have been and are being formulated by the U. S. Environmental Protection Agency, the states, and local governments for a variety of pollutants released into air, water, and land. The process requires consideration of items such as effects (health, economic, ecological), measurement techniques, current environmental levels, pollution sources, and the technology and economics of control. A variety of procedures based on legislative authority, technical problems, and administrative requirements have been devised and implemented by organizations responsible for development of standards[2,3].

This paper provides a frame of reference for discussion of fixed versus variable standards and generally explores some potential social and economic consequences of allowing variable standards. It will be shown that effluent or emission standards particularly exhibit both fixed as well as variable properties based on parameters such as time, geographical area, and source category. Present variability in standards generally results from independent analyses of individual pollutants and individual source categories. Because of the vital issues related to the levels and nature of environmental standards, their variability should result from an explicit consideration of emission control strategies aimed at achieving well defined environmental quality goals.

The implications of variable standards are discussed within the context of the air pollution problem as a specific illustration.

CONCEPT OF FIXED VERSUS VARIABLE STANDARDS

The concept of fixed versus variable standards may be confusing because of the large number of parameters which affect proper interpretation. For example, the concept pertains to variability (or invariability) with respect to time, space, among source categories and within source categories. Moreover, one considers standards for environmental quality levels which pertain to ground level concentration (or amount of pollutant in a given volume of the medium), as well as effluent standards which pertain to amount of pollutant discharge per unit of time, raw or processed material, or energy consumed or produced.

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*Presented by Robert Pikul, MITRE Corporation, at the National Conference on Managing the Environment.

TIME VARIATION

Variation in time could be represented by the point in time at which standards are to be achieved or the ability to vary ambient or emission standards over a relatively short period (e.g., seasonally, daily). A short time period is arbitrarily assumed in this paper to emphasize short term discretionary changes in standards based upon risks, suitable control techniques and profile of available resources compared to long term schedule of achievement fixed by law based upon perceived need for improving environmental quality. A general relationship between varying ambient levels and time lagged controlled emissions is shown in Figure 1.

SPACE VARIATION

This parameter refers to the possibility of allowing different standards in different geographical areas, in recognition of social values, geographical and climatic differences, and population density. It includes the option of allowing one level of power plant emissions in a municipality, a different (e.g., less stringent) level within a parent county and still another level on a statewide basis. It also includes the option of promulgating different standards for different sections of the country.

VARIATION AMONG SOURCE CATEGORIES

Variation among source categories applies to emissions or discharges allowed for various emitter categories which emit the same type of pollutant (e.g., steam electric generating plants, sulfuric acid plants). The EPA has prepared effluent guidance documents for twenty-one industries under the 1972 Federal Water Pollution Control Act[26], which identifies twenty-seven industries for which effluent guidelines must be prepared*.

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*The industrial categories for effluent guidance according to 1972 Federal Water Pollution Control Act are the following: canned fruits and vegetables, canned seafood, cement manufacturing, dairy products processing, electroplating, feedlots, ferroalloy manufacturing, fertilizer, glass and asbestos, grain mills, inorganic chemical manufacturing, iron and steel manufacturing, leather tanning, meat products and rendering, nonferrous metals, organic chemicals manufacturing, paperboard and builders paper, petroleum refining, phosphate manufacturing, plastics and synthetics, pulp and paper mills, rubber processing, soap and detergents, steam electric power, sugar processing, textile mills, and timber products.

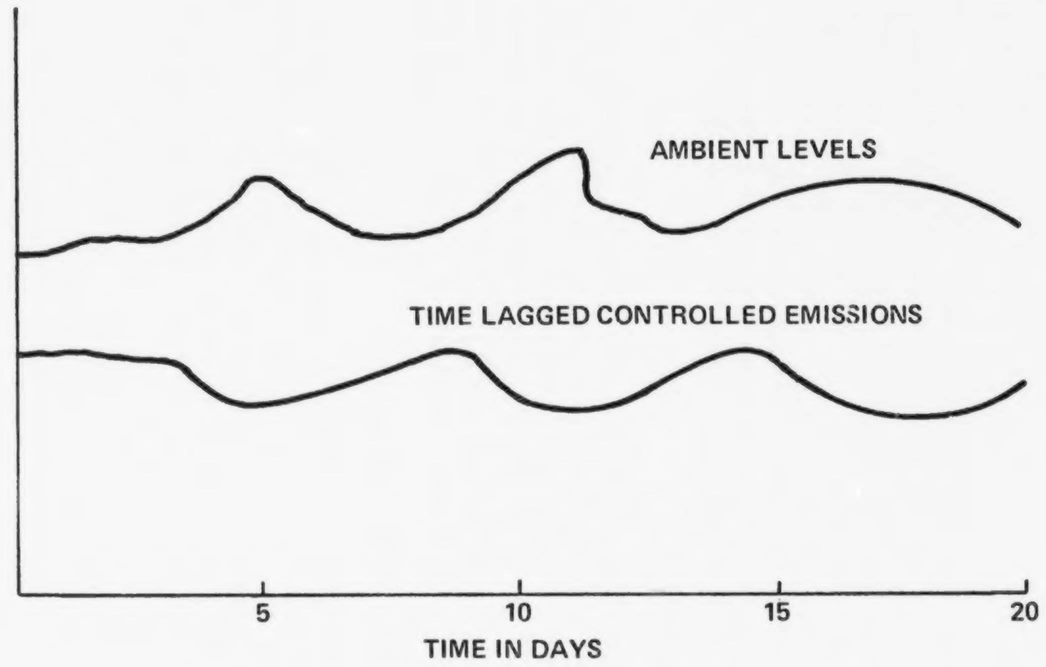

FIGURE 1

ILLUSTRATION OF TIME VARIABLE EMISSION STANDARDS

The EPA believes that guidelines are required for an additional fifteen areas*. According to these guidelines, discharges are generally fixed in time and space. For a specific pollutant, however, they vary among defined categories of sources.

VARIATION WITHIN SOURCE CATEGORIES

This parameter allows for the possibility of different emission or discharge levels for specific selected sources within a category. Limitation of sulfur dioxide emissions per unit energy from a specific power plant, for example, would be allowed to differ from that of other power plants in a given locale, based upon plant characteristics such as age, boiler type and stack size. An illustration of this variability applies to the effluent guidelines mentioned above since they are meant to apply to the most significant polluters.

Variation by Use

When considering water pollution, a major element affecting variation of standards is use of the water receiving the effluent.

Uses generally conform to the following categories: public water supply; industrial water supply; propagation of aquatic life; or water contact recreation. Not only do standards for a particular pollutant vary among use levels in different geographic areas, but the use levels themselves vary from state to state. For example, Illinois at one extreme has defined only two use categories, while Missouri has defined seventeen[15,27]. Water quality standards are fixed in time once they are implemented, but vary over geographical areas and by use. For example, as applied to the pulp and paper industry, the fecal coliform tests associated with pathogens in the effluent are generally limited to 1000 organisms per 1000 milliliters of water. A reduced concentration must be achieved, however, if receiving waters are used for shellfish harvesting or contact recreation sports.

AMBIENT AND EMISSION STANDARDS

Primary ambient standards to safeguard the public health and secondary ambient standards to safeguard public welfare were promulgated in April, 1971, for six primary air pollutants: sulfur dioxide, total suspended particulates, hydrocarbons, nitrogen dioxide, carbon monoxide and total oxidants. The effective date for achievement of primary standards has been set for 1975, and for secondary standards a reasonable time there-after. Ambient standards are fixed in time and space. Former EPA Administrator William D. Ruckelshaus has indicated that the Clean Air Act does not allow for increase of the health risk upon which the primary standards were formulated[18]. Changes to allow regional variability must be achieved through legislative action.

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*These additional categories for which the EPA feels that effluent guidance is required are as follows: beverages, cane sugar, coal mining, fiberglass insulation, fish hatcheries, metal ores, motor vehicles, natural gas liquids, paints, pesticides, petroleum drilling, pharmaceuticals, photo processing, sand and gravel, and water supply.

In contrast to the fixed ambient standards, emission limitations on stationary sources have been set according to State Implementation Plans (SIP's) and vary from state-to-state, among source categories and, in some instances, in time. Arkansas, for instance, allows the burning of any quality fuel as long as ground level ambient standards are not exceeded. Hence, emission standards are implicit. Although any generalization in this regard is hazardous, one might interpret this to mean that emissions could be allowed to vary during different periods of ventilation and assimilative capacity of the atmosphere as long as ambient standards are not violated. On the other hand, Alabama has an Implementation Plan which specifies .72 percent sulfur content for all coal burned and 1.08 percent sulfur for residual fuel oil. New source performance standards for utilities burning oil have been set at .72 percent[8].

Section 202 of the Clean Air Act specifies that emission of carbon monoxide and hydrocarbons for light duty engines and vehicles manufactured in 1975 be reduced to ninety percent of levels for engines manufactured in 1970. The limitations are the same for nitrogen oxides emissions for vehicles manufactured in 1976, based on levels emitted by engines in 1971. Recently, the EPA Administrator granted a one year extension for implementation of these standards. These limits, expressed in grams per vehicle mile, will be fixed in time for all sections of the country.

Emission standards for new stationary sources have been promulgated for various pollutants as they apply to Group 1 industrial categories (see Table 1). Standards are being developed for sources in Groups 2 and 3. Other groups may be considered to include sources such as gas turbines, lime plants, grain milling, auto assembly plants and petroleum refineries. It is likely that these standards may be fixed in time, space, and within source category (e.g., 0.8 pounds of sulfur dioxide per million BTU for liquid fossil fuels and 1.2 pounds of sulfur dioxide per million BTU for solid fossil fuels burned in all affected new steam generating plants), but variable among categories, for a particular pollutant. While total emissions from a given emitter may vary because of size of the emitter, emission rates are likely to be fixed.

Hazardous pollutant emission standards for mercury, asbestos and beryllium have been developed with reference to specific source categories and have similar space, time and source variability characteristics as new source performance standards. In the future, standards may be de-

TABLE 1

NEW SOURCE PERFORMANCE STANDARDS

	SOURCE
GROUP 1	Steam Generators >250 Million BTU/hr.
	Incinerators
	Portland Cement
	Nitric Acid Manufacture
	Sulfuric Acid Manufacture
GROUP 2	Asphalt Batch
	Petroleum F.C.C.
	Rendering Plants
	Brass and Bronze
	Basic Oxygen Furnace
	Sewage Incinerator
	Secondary Lead
GROUP 3	Non-Ferrous Smelters
	Aluminum Reduction
	Kraft Mills
	Coking Plants
	Phosphate Fertilizer
	Phosphorus Reduction
	Animal Feed Defluorination
	Ferro-alloy Plants
	Coal Cleaning Plants

veloped for other selected hazardous pollutants.*

SUMMARY OF VARIABILITY CHARACTERISTICS

The preceding discussion emphasizes that the interpretation of the concept of fixed versus variable standards is complex because one must consider the various types of standards, the environmental medium, and time, space, source category and use level parameters. The pervasiveness of environmental standards will have a significant impact on all major industrial sectors of the country and related economic and social activities. The examples of air and water standards are sufficient to illustrate this point. A summary of the present situation based on the preceding illustration is shown in Table 2. The designation of fixed (F) or variable (V) represents major indications rather than clear, unambiguous extremes. This summarization provides a frame of reference for discussion in the following sections. Within this frame of reference, only the ambient standards and mobile source emission standards may be characterized as fixed.

SOME OBJECTIONS TO VARIABLE STANDARDS

Consideration of variable standards might allow some flexibility in balancing risk of exposure with potential economic, technical and social effects of implementation of control technology. In addition, a control strategy which would permit variable emission standards (e.g., selective or intermittent controls) within source categories designed to meet ambient standards might provide some less stringent requirements for specific sources, with no deterioration in environmental quality. The issues are particularly important in cities with older housing and industries where implementation of fixed standards on a uniform basis might create significant dislocation and inhibit opportunity for economic and socially viable renewal and growth.

Reasons offered against adopting variable standards are discussed below.

INEQUITABLE TREATMENT OF SOURCES

This is an important concern to the individual emitter who is controlled more stringently than a neighboring or distant competitor. His costs,

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*These selected potential hazardous pollutants are: cadmium, arsenic, polychlorinated biphenyl, nickel, polycyclic organic matter, aeroallergens, reactive organic, pesticides, radioactive material, vanaduim, manganese, chromium, selenium, chlorine, hydrochloric acid, copper, zinc, boron, barium, tin, phosphorous, and lithium.

TABLE 2

FIXED VS. VARIABLE STANDARDS AND GUIDELINES FOR AIR AND WATER MEDIA

MEDIUM	STANDARD/GUIDELINE	TIME	SPACE	AMONG SOURCE CATEGORIES (UNIT RATES)	WITHIN SOURCE CATEGORIES (UNIT RATES)	USE
WATER	WATER QUALITY	F	V	—	—	V
	EFFLUENT DISCHARGE	F	F	V	V	V
AIR	AMBIENT	F	F	—	—	—
	STATIONARY SOURCE EMISSIONS (SIPs)	F	V	V	F	—
	MOBILE SOURCE EMISSIONS	F	F	—	—	—
	NEW SOURCE PERFORMANCE	F	F	V	F	—
	HAZARDOUS POLLUTANTS	F	F	V	F	—

F = Fixed
V = Variable
- = Not Applicable

theoretically, are higher, and he has a disadvantage in the marketplace. This is a valid concern, but on the other hand, the concept of equity ought to be viewed more broadly to include external costs of environmental damage. If specific emitter A degrades the environment more severely than emitter B, thereby imposing greater social and economic burdens on society, one can argue that A ought to pay more than B to improve the situation (given that society dictates that the situation must somehow be improved). It is not clear, without additional analysis, which alternative is preferable from a societal point of view.

Another aspect of this issue involves the equitable allocation of allowable air pollution emissions among and within specific emitter categories. One approach is to set an ambient air quality goal and to allocate emission rates in a localized area based upon the ambient effect of these emissions, so that the desired air quality goal is achieved, or surpassed. The similarity in the structure of the problems confronting economic decision makers in setting fiscal policy to environmental decision making is illustrated in Table 3 [14].

TABLE 3

SIMILARITY IN THE STRUCTURES OF
ENVIRONMENTAL AND FISCAL PARAMETERS

Structural Element	Environmental	Fiscal
Goals	Achieve ambient standards	Balance Budget, maintain high income and employment
Mechanism	Flexible emission rates	Flexible and graduated tax rates
Safeguards	Non-degradation	Debt retirement
External Influences	Variation in assimilative capacity of environment	Variation in GNP

The analogy between environmental and fiscal structures when certain environmental impacts result in irreparable, irreversible changes in the physical situation. The economy is man-made and not subject to similar irreversible changes.

Allocation of emissions, implied by allowing variable emission standards, is in some ways analogous to allocation of block grants for public assistance. Questions concerning how to set the maximum emissions (aggregate amount of assistance) and how to distribute the emissions (grants) are similar in each case. James A. Maxwell[14] suggested in 1955 that the distribution of the national aggregate in the form of block grants be set on the basis of minimum per capita expenditure. A standard effort for each state would be defined as a percentage of the income payment raised and spent by the state. Poor states would not reach the per capita standard and would receive federal grants to meet the minimum goal. Some wealthier states may receive no supplementary federal grants. In this example, the question of equity is based not on differences in amounts of federal grants received by different states but on a minimum national per capita expenditure for public assistance for all citizens.

The problems of environmental policy and standards are relatively recent national issues compared to the problems of fiscal and economic policy. Environmental problems require an understanding of the natural sciences and technology, utilizing fundamental principles of chemistry, physics and biology. The preceding discussion suggests that they also include allocation considerations which economic and fiscal policy makers have been confronting over a longer period of time. Personnel from these disciplines could provide a fresh perspective for the scientifically oriented environmentalists in the formulation of environmental standards.

COMPLEXITY AND ADMINISTRATIVE COSTS

Some people argue that variable standards are more complex to administer and enforce than fixed standards. Yet, one should consider whether the benefits of variable standards (e.g., in regard to degree of environmental quality achieved, greater availability of low sulfur fuels, overall operating costs, economic dislocations) are greater than for fixed standards and if these benefits outweigh potentially higher administrative costs. Our federal tax structure is inequitable, in an absolute sense, and highly complex; yet, according to figures from the Internal Revenue Service, administrative costs amount to only 0.5 cents on each dollar collected[24]. This is not to say that they could not be lower if a less complex tax structure were adopted. Administrative costs do not appear to be the overriding issue associated with overhauling the tax structure. Voluntary compliance is an important reason for low administrative costs of the tax collection. This technique could also be employed in enforcement of emission standards. It has yet to be demonstrated from a cost-benefit point of view that administrative costs would eliminate consideration of variable environmental standards.

NATIONAL ECONOMY

American companies have manufacturing facilities in many parts of the country and sell their products in national and worldwide markets. If motor vehicle emission standards varied from state to state, this would require that the manufacturers adopt a variety of control devices to meet the different standards. Assuming these devices were developed and performed effectively, it would probably not strain the industry's ingenuity to include another option in the assembly process. The combination of options already offered are in the thousands, and multiplying these by a factor of four or five should pose no serious problems. But, relocation by individuals from one section of the country to another would constitute significant problems in insuring that their vehicles met local standards. The monetary cost of retrofit to the motorist could be significant, in addition to the inconveniences likely to be encountered.

GENERAL IMPACT OF VARIABLE AMBIENT STANDARDS

What are some of the impacts of fixed versus variable standards? The national ambient standards for six primary air pollutants are designed to protect the public health and welfare. Questions have been raised concerning the values of the standard with respect to health risk. They may be changed as more health effects data become available, but variation on a geographic basis would require a change in the law.

A specific example of the drastic measures proposed to achieve the fixed ambient standard for oxidants* applies to the South Coast Air Basin which covers a major portion of Southern California, including most of Los Angeles County[4]. In 1970, this standard was exceeded in some locations on 250 days. Ten percent of the readings taken in the basin were .40 parts per million. There is a serious problem in achieving the ambient standard. Uncontrolled emissions of reactive hydrocarbons, a major precursor of oxidant formation, is forecast by the EPA to be 691 tons per day in 1977. In order to meet the oxidant standard, EPA estimates that emissions must be reduced to 160 tons per day. A variety of controls have been proposed to meet this goal, the most dramatic of which involve a reduction of over eighty percent in vehicle miles traveled during critical periods from May to October. A mechanism to achieve this reduction would rely on rationing of gasoline by as much as eighty-two percent. Other actions would involve: (a) installation of retrofit devices on all 1955 and newer vehicles (in 1972, there were about six million such vehicles in the area), (b) annual inspections, and (c) conversion of all 1971-1974 light and heavy duty vehicles in fleets of over ten cars to use gaseous fuels.

The economic and social impact of the proposals would include: increased cost to vehicle owners ($200-$400 capital and $5-$15 annual maintenance) with particularly severe impact on low income groups; increased reliance on car-pooling and public transit; reduced mobility; potential loss of income due to decreased mobility; economic curtailment of automotive service and supply facilities; changes in property values; reduced taxes; and potential development of effective rapid transit.

The total extent of these impacts are yet to be analyzed. Under the present provisions of the Clean Air Act, the ten million people in this section of the country face a severe change in their current life style, as well as a drastic reduction in the economic viability of the area.

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*160 $\mu g/m^3$ or .08 parts per million for a one hour period not to be exceeded more than once per year.

One can speculate on the potential impact that variable ambient standards might have on this kind of a situation. A higher limit might be less restrictive, but it is not clear by what amount. Figure 2 shows two hypothetical relationships between hydrocarbon emission limits and oxidant concentrations. The EPA has estimated that at .08 parts per million, the emissions must be at most 160 tons per day (point P, Figure 2). Beyond this point, curve B indicates a more favorable emission allowance than curve A. If one were contemplating raising the oxidant standard from .08 to 0.15 parts per million, then the emission limit would be 200 tons per day if curve A described the situation (point P'), and would be 425 tons per day if curve B did (point P''). One might conclude that the increased risk represented by increasing the standard buys little relief under curve A, but provides significant relief under curve B. It would be desirable to quantify the risk as a function of the concentration to arrive at a proper balance of risk and impact and cost of limiting emissions.

Let us assume that curve B prevails and that at 0.15 parts per million oxidant concentration there is little more noticeable effect than increased eye irritation. It is conceivable that the citizens in the area may opt for the greater risk associated with the higher standard in order to suffer a less severe curtailment on limitation of emissions. While a detailed analysis is required for obtaining precise quantitative estimates, it is safe to say that most adverse impacts (related to emission controls) listed above would be reduced. Suppose the limit of 0.15 parts per million might be achieved by increasing car pooling by fifty percent; this might represent a far more attractive option than living with the consequences of achieving a .08 parts per million standard. As long as great uncertainty exists concerning precise health effects of various concentration levels, consideration of variable ambient standards on a geographical basis has some merit. No one would argue that the Los Angeles area has had acceptably clean air over the last thirty years. On the other hand, the general area has attracted ten million people and offered some form of satisfaction of human needs.

People have long accepted risks associated with the automobile. Former Administrator Ruckelshaus has reported that eighty-five percent of the people surveyed in an opinion poll indicated that the consequences and risks related to the automobile - displacement of homes and business by highways, air pollution, noise, congestion, two million deaths and tens of millions injured in this century - was worth the freedom of mobility. Perhaps the people in southern California may feel that they would prefer to preserve a significant portion of that freedom at the expense of relaxing the air quality standard[18]. Any such choice made by people in this area has to consider its impact on the people outside this area.

Acceptance of variable standards in different geographic areas might allow people to make a choice regarding where they may want to live, based on a consideration of risk associated with air quality and other economic and social factors. Apparently, however, environmental awareness does not yet play that prominent a role when people choose their residence. Financial constraints and economic opportunities probably

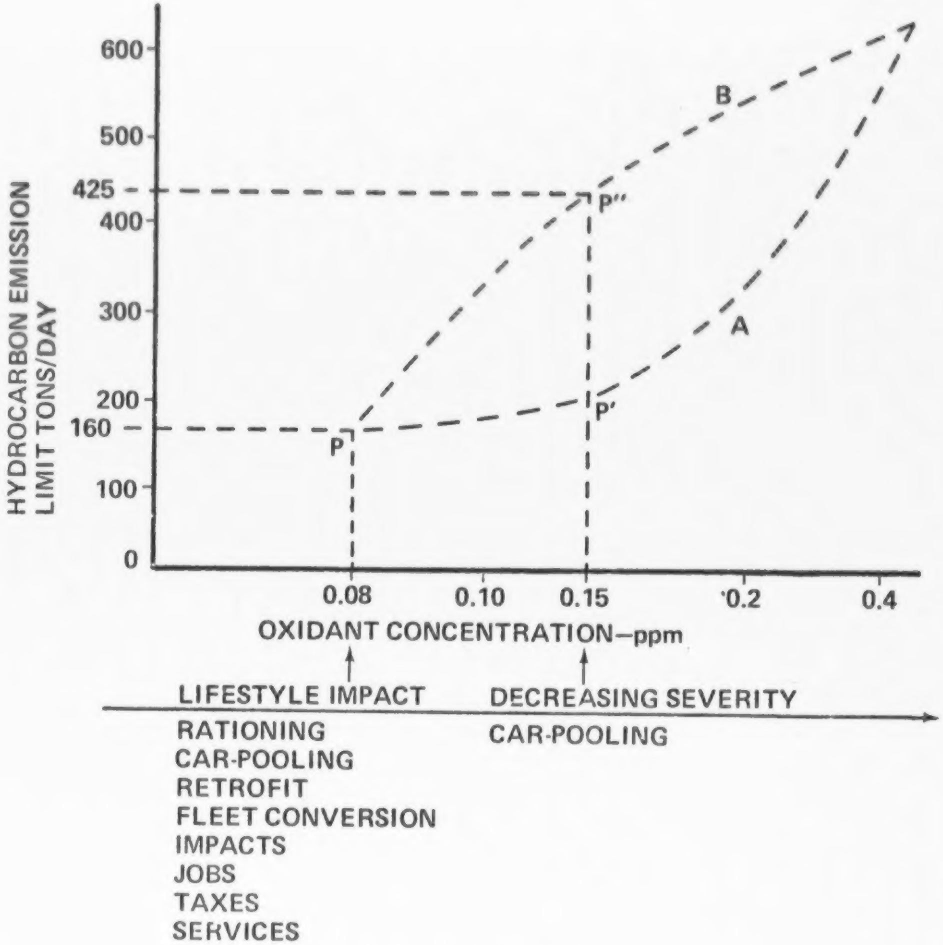

FIGURE 2

ILLUSTRATIVE RELATIONSHIPS - HYDROCARBON EMISSIONS VS. AMBIENT OXIDANT CONCENTRATION are more significant factors. As pointed out in a recent report of the Adivsory Committee on the Biological Effects of Ionizing Radiation[21],

> ...the annual difference in natural radiation between a location in Louisiana and one in Colorado might be 100 mrem or more. Even a person who knows this probably does not take this difference into account in deciding to change his residence.

An adverse impact of allowing variable ambient standards might be to drive industry into geographic areas allowing higher (numerical) standards. These areas are likely to be dirty and heavily populated. This would occur particularly if standards in a given area were set to allow degradation of the current ambient levels. To prevent areas with severe air pollution problems from getting worse, and to discourage industries from seeking air pollution control havens, a non-degradation limit with respect to current ambient air quality might be imposed.

In new town development areas, more stringent ambient standards might be promulgated on the basis of utilization of feasible new technology (e.g., emission controls, waste heat utilization, recycling) which might be planned, designed, and applied at the beginning to achieve a high level of environmental quality.

GENERAL IMPACT OF VARIABLE EMISSION STANDARDS - STATIONARY SOURCES

Stationary source emission standards tend to be variable among source categories, but fixed among emitters within a specific category (Table 2). Emission standards and regulations should be set on the basis of achieving an ambient level goal. Emission regulations prepared by the states attempt to achieve ambient standards throughout an Air Quality Control Region, based on the monitoring site having the highest ambient value in the Region. All emitters within a combustion source category, for example, must burn fuel in order not to emit more than a maximum amount of sulfur per million BTU. This tactic often results in severe restrictions on some emitters who contribute relatively little degradation to air quality levels. In older urban areas, this may arbitrarily impose severe economic control costs on some plants. This may result in the abandoning of industries and residential apartment areas, creating hardship among the lower and middle income groups. Secondary effects may include intensifying social unrest in the form of increased delinquency, crime, and dereliction. A combination of allowing flexible ambient standards with more selective application of controls may allow these areas to be economically and socially maintained.

The implementation of variable emission standards is interrelated with strategies for emission controls that employ two types of strategies - fixed and intermittent.

FIXED STRATEGIES

Fixed strategies in pollution control consist of techniques such as process modification, time variance in implementation of regulations, and selective control of sources whose emissions constitute the greatest degradation to ambient air quality.

The results of several studies tend to support greater flexibility in emission standards and application of control strategies. Plotkin and Lewis have compared the application of uniform emission standards to source categories with a least cost selective control strategy for the St. Louis Airshed[17]. The least cost approach achieves a minimum cost of control by applying the most stringent controls to sources which contribute most to air quality degradation or whose marginal control costs are low, or both. The uniform emission control strategy, according to the analysis, would cost $10.4 million annually while the least cost strategy would cost $6 million. The ground level concentrations for the least cost strategy were higher than for the uniform emissions strategy. The additional benefits of uniform controls were not computed to relate them to the additional $4.4 million annual cost. Additional analysis performed by the EPA recently for the St. Louis area indicates a cost reduction factor of 3 to 6 for selective control (with respect to fixed emission standards) depending on the emission level[11].

Results of a study for three Air Quality Control Regions conducted by Krajeski and Yeager[9], show that seventy-five percent effective control applied to a relatively small number of emitters on a selective basis would result in achievement of the primary sulfur dioxide standard (Table 4). For example, control of 300 emitters at seventy-five percent effectiveness in the New York area reduces overall emissions by sixty-four percent and achieves the ambient level at all receptors (Table 5). All emissions requiring control are combustive in origin. Since the New York area may be using five million tons of coal and 215 million barrels of residual fuel oil annually, less stringent emission controls on thirty-six percent of the fuels would provide a substantial contribution in reducing projected clean fuel deficits. These savings in clean fuel might be extended on a national basis. Moreover, allowing variability of extent of controls within and among source categories might allow even further economies.

Another alternative to allow more flexibility in emissions has been a proposed emissions tax. Many investigators have examined the implication of an emission tax which, if set at a proper rate, would provide an incentive to minimize operating costs and reduce emissions. Tax revenues could be applied toward developing better control technology and alleviating damage costs[7,12,19,22,23].

Increased flexibility might allow most areas in the country to achieve clean air standards with minimal imposition of economic and social dislocation.

TABLE 4

SUMMARY OF SELECTIVE CONTROL STRATEGY APPLIED TO THREE AQCR'S

AQCR	NO. OF EMISSION SOURCES	NO. OF EMITTERS CONTROLLED AT 75% EFFECTIVENESS	% OF EMISSIONS REQUIRING CONTROL
New York	1,285	300	64
Philadelphia	700	53	19
Niagra Frontier	541	17	27

TABLE 5

SELECTIVE REDUCTION OF SO_x EMISSIONS TO ACHIEVE 80 $\mu g/m^3$

NEW YORK AQCR

EMITTER CATEGORY	PRESENT EMISSIONS		UNCONTROLLED EMISSIONS FROM SOURCES REQUIRING CONTROL AT 75%		TOTAL CONTROLLED EMISSIONS	
	SOURCES	TONS/DAY (A)	SOURCES	TONS/DAY (B)	SOURCES	TONS/DAY (C)
Industrial Combustion	106	238	14	111	106	155
Industrial Process	42	79	0	0	42	79
Utility Power	31	1,389	21	1,039	31	610
Area Sources	1,106	2,020	265	1,248	1,106	1,084
TOTAL	1,285	3,726	300	2,398	1,285	1,928

$C = .25B + (A-B)$

INTERMITTENT STRATEGIES

Air quality is generally a function of emissions, assimilative capacity of the environment, control strategies and background levels. The dynamic interplay of these parameters constitutes an intermittent control strategy. Examples of these include[25]: load switching (e.g., drawing power from outside an area which is experiencing low assimilative capacity); work pattern modification (e.g., staggering of work schedules); and fuel switching (by sulfur quality or by type, i.e., coal to oil).

Criteria for evaluating intermittent control systems, based on meteorological conditions have been developed by EPA[5]. Fuel and load switching strategies (seasonally, daily) to minimize use of low sulfur fuels while still achieving ambient standards have been described in several studies[1,6,13]. The Tennessee Valley Authority has had experience in investigating applications of fuel and load switching techniques based upon meteorological conditions at the Paradise Steam Plant. Development costs were estimated at $262 thousand and annual operating costs were estimated at $103 thousand[10,20].

E. A. Ward has made a gross estimate of the national impact of applying a fuel quality switching strategy[25] (i.e., switching from low sulfur to high sulfur content coal or low sulfur to high sulfur oil during days of good ventilation or high assimilative capacity). An analysis of Air Pollution Potential Advisories issued by the National Weather Service indicates that eighty percent of the time it would be possible to burn high sulfur content fuel because the assimilative capacity of the atmosphere is high. In 1970, steam electric plants consumed 328 million tons of coal and 287 million barrels of oil. About two-thirds of the total power generated from plants which burned coal (either exclusively or in combination with gas or oil), was generated by plants which burned coal exclusively. It may be possible, therefore, for power plants to burn as much as

$$(328 \times 10^6)(2/3)(.8) = 176 \text{ million tons}$$

of higher sulfur coal based on 1970 consumption. Because of concentration of plants in populated areas, low sulfur coal must probably be burned even on some days with good ventilation in order to achieve ambient standards. Even if twenty-five percent of this estimate is realizable, it would save about forty-four million tons of low sulfur coal out of a projected deficit ranging from under 100 million up to 250 million tons. Assuming a price differential of $5 per ton between low sulfur and high sulfur coal, this represents a fuel cost savings to the utilities and to consumers of about $220 million annually.

About thirty percent of the total generating capacity of plants which burn oil is generated to some extent by plants which burn oil exclusively. A similar analysis as the one described for coal, above, indicates a maximum potential of burning seventy million barrels of high sulfur oil on good ventilation days. Assuming that twenty-five percent is actually attainable, a potential switch from low to high sulfur oil by utilities might produce savings amounting to about eighteen million barrels per year. Assuming an average of \$1.25 difference per barrel between low and high sulfur oil, an annual fuel cost savings of \$22.5 million might be realized. The low sulfur fuel would be available for use by area sources whose emissions generally have a relatively high impact on ambient air quality.

The price for the fuel savings is paid by the utilities in that they must install and operate the necessary forecasting and monitoring systems to allow implementation of the strategy. About 1000 plants burn coal or oil exclusively. If as many as a half of these installed and operated the necessary intermittent control system monitoring equipment and processing facilities, the total development cost would be about \$131 million and the total operating cost would be \$51.5 million annually, according to the TVA Experience[20]. The development cost would be recovered within one year by the savings in fuel costs, with an additional potential annual savings amounting to \$190 million. The data suggest that these options may offer promising possibilities if they are confirmed by a more detailed study.

CONCLUSIONS

This paper has illustrated some types of potential impacts associated with implementation of environmental standards characterized by varying degrees of flexibility. Variable standards should not be interpreted as frequently allowing spurious and arbitrary changes. This would be unacceptable to the general public and would create uncertainty and distrust of the standard setting and enforcement process by private industry. There are many opportunities to allow for implementation of more flexible standards in order to achieve environmental quality goals on an economical basis, particularly for emissions and effluent discharges. These opportunities must be explored and selected through systems analysis of interrelationships among control technology and environmental, social, and economic impacts. Related issues are forming around apparent conflicts between obtaining an improved environment and abundant energy production and consumption. Both abundant energy and a clean environment are related to the overall quality of life. The question of fixed versus variable standards should be examined in the hope of minimizing or eliminating the apparent conflicts.

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ENFORCING ENVIRONMENTAL LAW IN THE CITY

Norman Redlich*

Several broad concepts are important in organizing municipal government to play its role in environmental control. First, government at the municipal level must organize and structure itself environmentally. Prior to Mayor John Lindsay's administration in January, 1966, in New York City the traditional municipal departments handled environmental programs: the Sanitation Department, the Department of Air Pollution Control, the Department of Water Resources, etc. These separate departments were not unified in an environmental context. Since that time, these entities have been combined into one so-called "super-agency," the Environmental Protection Administration, which has the capacity to plan, select priorities, and to budget in environmental terms. For example, if an air pollution control measure would prevent burning garbage in incinerators, the impact of that action on solid waste collection and disposal should also be considered before the decision is made. In a single agency, such coordination is facilitated.

Local governments as well as state governments have to organize to make the hard priority choices, for example, the selection of power plants. In New York, we have created an interdepartmental committee on public utilities. We recognize that to deal with such questions as rate-making, we must first decide whether we want to curb the use of electric air conditioners and electric heating and where we plan to locate a particular plant. To make these decisions we needed a combined inter-governmental roof consisting of our city planners, our Consumer Affairs Commissioner, our Environmental Protection Administrator, and the Administrator of Municipal Services (who is responsible for providing power for the city). It is important that local governments create a structure which can deal with the complexities of the environmental conflict.

There are two aspects of the legal framework that appear obvious, but are often overlooked -- the method by which we identify and regulate pollution problems, and the enforcement mechanism. Traditionally, local governments controlled the environment through a haphazard and non-scientific approach -- chasing smoke, trying to keep people from making loud noises, etc. Enforcement consisted of issuing summonses to people who were making loud noises, or who were chasing dark smoke coming out of chimneys. People often ignore these summonses. It is an improper use of valuable police resources for the police to spend time following up these violations.

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Another traditional method of law enforcement is the abatement of nuisances. When somebody complained enough, the city's lawyers went to court in order to "abate a nuisance." This is basically an injunctive remedy which is totally ill-suited to the urban environment. There simply are not enough policemen to issue summonses, nor enough city lawyers to handle injunctions, nor enough courts who are willing to spend their resources in contempt citations. The urban scene is different from a rural scene, where the injunctive remedy against a major polluting factory has some significance. The urban scene requires different techniques, some of which we have tried in our city.

The basic technique is to deal with the cause of pollution by imposing standards on the actual device which is the polluting instrument. Such devices include incinerators, noise generators, and fuel-burning equipment. Another enforcement technique is requiring permits to operate certain types of devices -- this enables the enforcing agency to set certain standards in order to obtain such a permit. We also set standards for fuels. The permissible sulfur content in our fuels is a standard which has been set by local law in our city. Compliance need not be measured by the old cumbersome method of determining whether there was too much sulfur dioxide or particulate matter in the air. The New York City Air Pollution Code and the Noise Pollution Code are scientific documents setting certain very precise standards with regard to the amount of contaminants in the air, the amount of sulfur in our fuel, and the decibel level of various types of noise devices.

Moreover, the Administrator has the power and authority to test various devices to determine whether they are meeting these standards. Setting very precise standards is a two-fold weapon. First, they enable a fairly scientific method of testing, so that even without a complaint we can test a particular device to see whether it is exceeding a decibel level or whether it is exceeding a given air pollution level. Second, by setting specific measurable standards, violators can be prosecuted. Through the use of standards-setting and permit requirements, a range of enforcement techniques become available. It becomes possible to prosecute someone for failing to renew an operating permit or an operating certificate. A cease and desist order can be issued to prevent a person from operating without a given type of approved certificate. An order can be issued compelling various types of improvements in the particular polluting device in order to eliminate the offending characteristics.

It is terribly important to remove these cases, as much as possible, from the courts and into an administrative agency. The City of New York has created an environmental control board which acts as an administrative tribunal, consisting of five city officials and four qualified persons from outside the government. Their job is to enforce the aforementioned environmental provisions. It has the power to issue cease and desist orders; it has the power to revoke permits and operating certificates; and it has the power to impose civil penalties which can be as much as $100 per day for every day of violation. These civil penalties can be enforced in court. Thus far, under our law they must be reduced to a judgment. We are hoping to secure state legislation which would enable us to enforce these penalties without the necessity of reducing them to judgment, subject only to judicial review (under the doctrine of preventing arbitrary, illegal and capricious penalties). One of the great unsettled questions in this area is the extent to which the courts will respect the decisions of an administrative tribunal. If they do not give weight to the decisions of the administrative tribunal, the proceedings will be repeated in the courts and the entire administrative process will have been largely a waste of time. On this the returns are not yet in.

Finally, we have adopted a citizen complaint technique, which is particularly useful at the local level. A citizen can file a complaint with the environmental control board alleging a violation of the various standards set forth in our code. It is the option of the administrative agency to prosecute that complaint. If it decides not to, the citizen can prosecute it himself in his own course. If there is a fine imposed, there is a sliding bounty system, whereby the citizen will get a percentage of whatever is recovered, and will get a higher percentage if it turns out that he was right and the government agency was wrong in refusing to prosecute the citizen's case. This system has evoked widespread criticism that we are creating a city of bounty-seeking informers, but we think it is possibly a very useful enforcement method.

The use of these major legal weapons and insititutions by local governments can enable them effectively to play their role in controlling the environment.

CHAPTER VI: ENVIRONMENTAL MANAGEMENT INFORMATION SYSTEM

As the complexity of environmental problems increases, the decision maker's need for comprehensive information increases. In most regions, the environmental manager must understand the technical and legal issues related to industrial pollution, resource management, interpretation of pollution levels, transportation systems, and population growth. The development of effective programs and policies of environmental management requires an adequate means of obtaining, processing, and applying information or data to these types of problems.

In designing an environmental management information system (EMIS), managers are increasingly turning to computer technology and quantitative analysis. The first step in devising an EMIS is to define the economic and social objectives or desired output of the system.

The data collating and processing phases are based on the manager's determination of the type of information system required. Setting a broad goal such as "improving the region's environment" will complicate the task of implementing an EMIS. While such a broad goal may be a long-term decision, the manager must define goals and objectives more specifically. The manager must determine what information is needed to guide and strengthen his decisions. Information needs, for example, should be expressed as examining pollutant levels or air quality standards; evaluating the transportation system in relation to its pollutants, capacity, and future needs; or examining land use for the region.

Managers must be cognizant of those parameters that will be included in order to achieve an adequate final system design. The final determination for the systems operation should be made by the manager rather than research and computer analysts.

Specific objectives of the information system should be carefully conceived and explicitly stated. What types of pollutants should be considered? What types of land and its uses should be examined: recreational, residential, industrial? What alternatives to transportation systems should be examined: buses, rapid transit, banning automobiles, gas rationing? What economic characteristics should be examined: population, income, employment, prices, production? The objectives should be carefully detailed without, at this stage, detailing how results should be achieved.

Subsequent to detailing specific objectives, it is necessary to establish the constraints that ought to be built into the system.

Constraints are limitations placed on the achievement of an objective. For example, cost, time, and personal constraints may be placed on achieving the overall objective of an EMIS. Limitations will probably have to be established for the variables in relation to those controllable by management and those that are not. Non-controlled variables involve levels of detail and resource assignment too costly and time consuming for most information systems.

What appears to be a good pollution information system at a reasonable cost may turn out to be inadequate when new viewpoints and alternatives are examined, especially for the variables included and overall system design. An additional expenditure of only five percent for better data collection may be all that is needed to transform a fair system into an excellent system.

Definite criteria should be established for evaluating each alternative. These criteria may involve simply a written report indicating pros and cons of each alternative to a specific analytical process for evaluation. Each alternative should be evaluated in relation to the original objectives and constraints. The manager must keep an open mind to alternatives and be ready to modify unrealistic objectives, goals, constraints or the alternatives, if a viable system is to be established.

The manager must define the specific economic, demographic, and environmental variables relevant for policy-making, based on present knowledge and problems and future expectations. A variable is an element (pollution, land use) or attribute (amount, size, age) which is under empirical investigation. Variables may be qualitative or quantitative, and the concern of the environmental manager is to understand the relationship among variables in order to assist in the evaluation of competing policy alternatives.

The next phase involves determining whether the necessary data is available and able to be maintained and collected on a continuing basis, at a reasonable cost, and with an acceptable level of statistical validity and reliability. For example, in order to evaluate economic growth, data must be available on population, income, employment, and housing. Comprehensive analysis may be limited if the data is not collected on a continuing basis or if there are distortions in the data due to variations in methods of collection.

The goal in the data collection process is to create standard definitions, identifications, and classifications of data so that the manager receives timely, reliable data that is useful for inter- and intra-regional comparisons. Ultimately, the information system, more than a simple inventory of data processes, must transform data into useable information for purposes of decision making. An unrealistic data base design is the major reason for an information system's failure (i.e. one that is overly detailed, or fragmented). The failure is a result of poor design, unused and unuseable data, and excessive cost burdens to maintain current data. Data elements common to more than one component of the system should be identified and evaluated with a view towards multiple purposes (i.e. an integrated data base).

A necessary tool for recording, storing, and processing data is the computer. It combines speed with accuracy and economy; it can sort, store, calculate, merge, correlate, and otherwise manipulate data at high speeds. They rarely make mistakes and reduce data collection and processing costs. Most mistakes that do occur are caused by humans; the computer performs only those functions programmed for it. Three important characteristics explain the extraordinary utility of computers: storage capacity -- which permits the adaptation of a central or common data file and allows for the inclusion of all data input for each process; direct interrogation of the system via remote inquiry devices; and legibility of computer output -- which may take the form of tabular listings, mappings, graphical display, and printed text.

An accurate, worthwhile computer-based EMIS cannot be built overnight. The manager should ascertain, with expert assistance, the computer hardware and software (e.g., computer programming) needed for the application of a system. Many presently operating regional systems may be modified, expanded or combined, thereby reducing the time needed to establish a working data base and EMIS. However, the capabilities of any computer system are limited by the ability and techniques of the computer analyst or programmer. It is the analysts who conceptualize a problem and make decisions about how a problem will be solved. Analysts integrate data with statistical and mathematical techniques. The environmental manager is responsible for the overall design and guidance of the system. In thinking about alternative designs for a total EMIS, the manager should consider in-house capabilities, as well as assistance from universities and consulting firms.

A properly instituted EMIS will give managers more planning time without the need for extensive research, provide for the evaluation of alternative actions, and anticipate environmentally induced changes that will effectively centralize the control of the information and analysis process.

Implementation of an EMIS requires a close working relationship between managers and research and computer analysts. Analysts translate technical methods and concepts into a practical language to meet the needs of the manager. However, the manager must have sufficient knowledge of the disciplines available for analysts, have a rudimentary understanding of their techniques and language, and be able to grasp the importance of quantitative analysis.

MODELS AND SIMULATION

In order to respond to a request for information on an environmental problem from the manager, the research and computer analyst's first step is to develop a model or simulation.

Models present a facsimile of reality. A model simplifies reality by using a small number of variables to describe, explain and predict a phenomenon (e.g., using population increases to predict additional employment).

There are three basic types of models: iconic or physical; analogue or abstract; and symbolic. The iconic or physical models look like what they represent, that is, a "model" airplane or ship, or maps and drawings. The analogue or abstract model uses symbols to represent a set of properties of reality, for example, using words to describe an object or lines on a photograph to represent contours. The symbolic model uses symbols (letters, numbers) to represent a relationship of reality. This type of model is usually specified by a mathematical relationship.

Models are simplifications of reality that supply alternatives for solving a problem. While it is possible to make extremely complex models, they are usually incapable of being used directly for decision purposes without additional analysis.

Models may be simplified in four ways. First, variables may be omitted. Only those variables offering a specified level of significance should be maintained in a model. For example, transportation variables that may be included are buses, cars and trucks. However, detailing makes and models of each would add little additional significance to the outcome. Variables may also be aggregated to reduce their number. Income groups may be classified as high, middle, and low rather than broken down into more refined categories.

Second, the manner in which variables are used may be changed. Rather than using explicit distributions of a variable, an average value may be used so that the variable may be considered a constant, for example, the average number of new housing starts per month.

Third, relationships between variables may be changed. The most common type of relationship change is substituting a linear relationship for a non-linear one. For example, pollution may increase at an increasing rate as automobile weight increases, until some limiting weight is reached whereby pollutants increase at a decreasing rate no matter how much more an automobile weighs (an exponential function). This type of situation may be simplified with a straight linear relationship explaining that pollutants increase as automobile weight increases.

The fourth possibility is to modify the constraints of the model. Constraints can be added, subtracted, or changed to simplify a model. Requiring industry to add pollution abatement may cause a shortage of production to occur to some maximum limit. The model would obviously need an estimate of these shortages, although such an estimate would probably be extremely difficult to obtain. However, as the shortage increases, the costs and difficulty in reducing pollution may become higher. A constraint may then be built in so that lost production does not exceed this upper amount.

Environmental models are time consuming to construct and extremely complex. It is therefore necessary to construct a model in parts so that the final result is a multiple model (or a large model with many sub-models). The output of one model may become the input to other models. Determining air quality standards would require, at a minimum, the input from an economic characteristics model to determine population and industrial growth. Input would also be required from a transportation model to determine traffic congestion and patterns, which in turn requires input from the economic growth model. Multiple models may function completely independently, with each model providing a set of solutions, or sequentially, with all the models working together to provide a set of solutions.

Simulation is an imitation of reality. Simulation of a system involves the manipulation of a model (a representation of reality) to yield as true a picture of reality as possible. Model manipulation allows alternative policies and decisions to be tested to eliminate expensive trial and error methods.

A simulation requires data on how various operations are interrelated, as well as a time frame for the different conditions and objectives to be examined. By using multiple iterations of a designed model, a simulation allows examination of the different phases of a system.

A model may predict the final levels of pollution, but it cannot tell how those levels were arrived at. A simulation, in contrast, examines the transitional states between the present and the future. It details the time frame for each aspect of a solution. While pollution may indeed decrease in the end, it may have had to increase substantially in the interim. Simulations offer the possibility for developing transitional phase solutions.

EMIS MODELS

At the National Conference on Managing the Environment, four workshop sessions were devoted to information systems. Summaries of these sessions, as well as some of the more pertinent speeches,are discussed below. The first system to be discussed is the Integrated Regional Environmental Model (IREM), designed for the San Diego region. This model is used as a tool for developing and implementing a comprehensive regional plan. The second is the Arizona Trade-Off Model (ATOM), designed specifically for the state of Arizona in order to provide the state's policy makers with alternative choices for achieving desired goals and objectives. Third, the General Environmental Model (GEM) was designed as a simulation model to aid policy makers in developing strategies to deal with urban problems. Fourth, the Strategic Environmental Assessment System (SEAS) is being prepared by the Environmental Protection Agency as a general national policy making model for use by localities and regional planning bodies to interrelate national environmental policies. The summaries that follow are presented for guidance to environmental managers for planning an information system.

The ATOM and GEM models are described in detail with respect to the working models and the interrelationships that should be considered. The IREM model is a summary paper describing an overall integrated model without discussing the finer points of modeling techniques. Finally, SEAS is summarized in the speech delivered by Dr. Stanley Greenfield, Environmental Protection Agency Assistant Administrator for Research and Development.

INTEGRATED REGIONAL ENVIRONMENTAL MANAGEMENT PROJECT

The Integrated Regional Environmental Management (IREM) Project is a product of the San Diego County Comprehensive Planning Organization (CPO) program to develop and implement a comprehensive regional plan. The IREM project is part of a formulation for a fully integrated and analytically sound comprehensive plan.

The project is based on a regional modeling system to develop accurate and sound information. The planning models are designed to evaluate alternative policies for land use and transportation patterns. Nine steps were defined for establishing a comprehensive plan:

1) Identify a set of broad long-range regional goals and objectives;

2) Specify alternative sets of policies and public actions which can be used to achieve these goals;

3) Develop alternative plans based on policy combinations to represent future development and transportation;

4) Test each alternative plan concept to determine the effectiveness of alternate policies for achieving goals;

5) Identify pro and con aspects for each alternative plan;

6) Evaluate each alternative plan for effectiveness, feasibility and cost;

7) Select alternative plans and policies;

8) Decide upon an implementation plan that utilizes public facilities and services; and

9) Monitor actual growth and development and relate to goals.

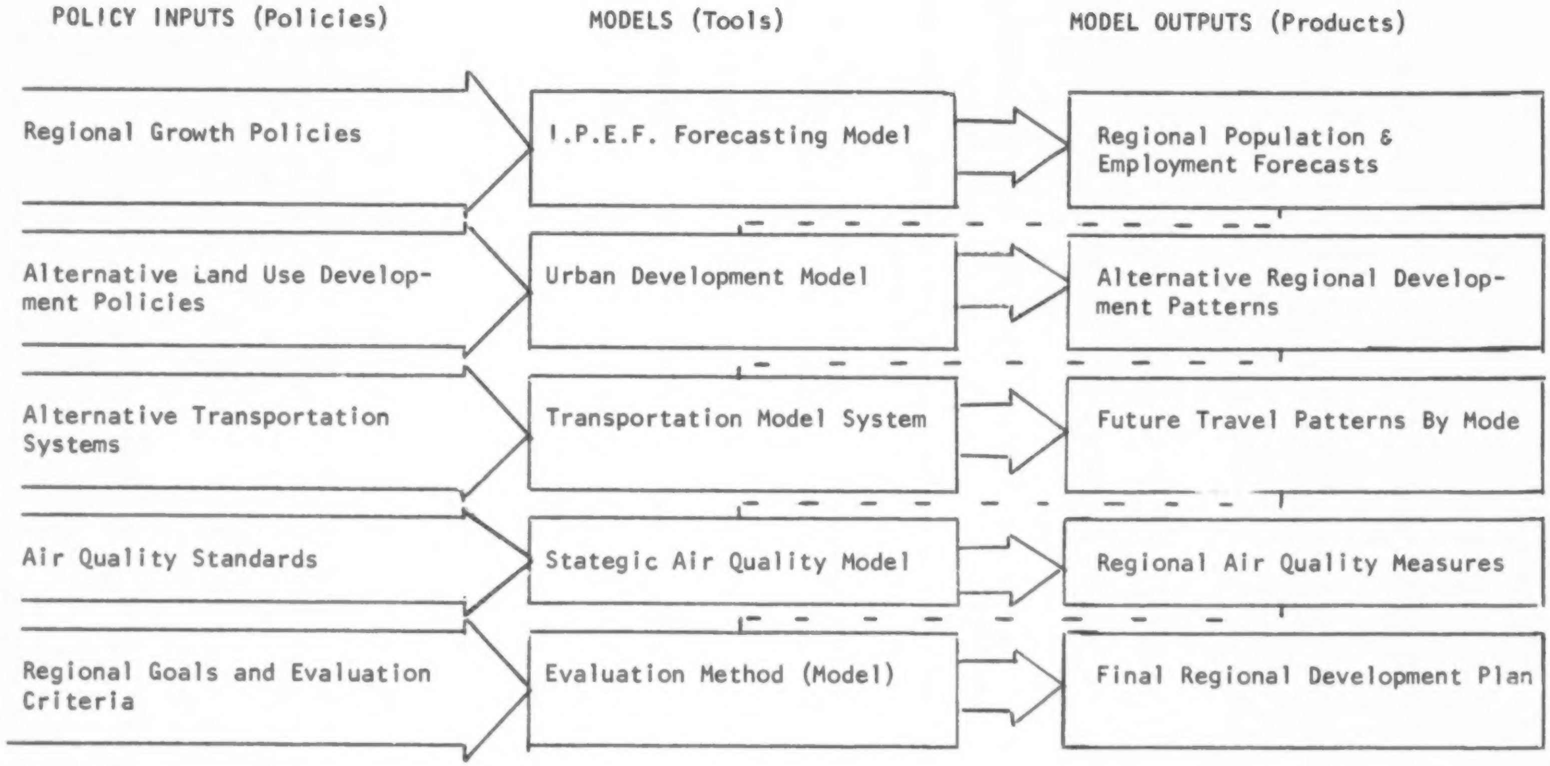
IREM relies heavily on five computer models. Each model examines a different aspect of a regional environment. The elements of the regional models system may be used independently for analyzing a specific problem for which it is best suited, or may be used in sequence, with the output of one sub-model serving as the input of another. Figure 1 shows the individual models and their linkages.

INTERACTIVE POPULATION/EMPLOYMENT FORECASTING MODEL

The Interactive Population/Employment Forecasting (IPEF) model is designed for long range forecasts of population and employment, given various regional policies. For example, regional population and the quality of growth could

Figure 1.

REGIONAL MODEL SYSTEM


POLICY INPUTS (Policies)
MODELS (Tools)
MODEL OUTPUTS (Products)
Regional Growth Policies
I.P.E.F. Forecasting Model
Regional Population & Employment Forecasts
Alternative Land Use Development Policies
Urban Development Model
Alternative Regional Development Patterns
Alternative Transportation Systems
Transportation Model System
Future Travel Patterns By Mode
Air Quality Standards
Stategic Air Quality Model
Regional Air Quality Measures
Regional Goals and Evaluation Criteria
Evaluation Method (Model)
Final Regional Development Plan

be substantially affected if there were a regional growth policy.

The model responds to alternative policies and tests their effects and impact on unemployment rates, family planning, health care, industrial expansion and population migrations.

The IPEF model has five regional growth components: births; deaths; employment-related migration; military-related migration; and retirement-related migration. The components have various mixes that are simulated for specific policy alternatives.

Each policy assumption which is used, produces a forecast of population by age, race, sex and industry employment for five-year intervals. The generalized output may be in graph or tabular form.

URBAN DEVELOPMENT MODEL

The Urban Development Model (UDM) is itself a set of sub-models that simulate development patterns in the San Diego region. The population and employment forecasts of the IPEF model are the input to the Urban Development Model for regional distributions. Given growth policies and development constraints, the UDM distributes future incremental growth and identifies the growth pattern for sub-areas within the region.

The model uses an "allocation function" to examine potential development within the region. The three basic factors used are: (1) The accessibility to employment opportunities, examining commuting patterns and travel times; (2) the availability of developable land, considering residential densities and open space policies to locate this developable land; and (3) the "attractiveness" of a given area, based on characteristics which would attract developers (housing values are used as the measurement for "attractiveness").

The alternative policies of transportation systems, governmental services and land use are used as input for the allocation function. Transportation factors considered are those which affect travel times, costs and alternative modes of transport. The urban governmental factors considered are municipal water and sewer services. The identification of land specifically withheld from development is based upon land use constraints, which were established for topological or planning considerations.

Each of the policies (transportation, governmental services, and land use) works independently and in concert with the others to determine development that will occur in the region. Primary regional factors such as income, family size, housing needs, recreation, industry employment, government goods and services and transportation needs are all interrelated to establish the final development growth patterns.

The Urban Development Model provides output on how the region would develop under various policy alternatives. The model forecasts an economic and land use profile for a variety of geographic units. Details on total population and dwelling units, employment by place of work and place of residence, total land use acreage by type of use, household income, housing values and property, sales, and income tax revenues are available by census tract (315), regional traffic zones (85) or the smallest geographic unit, traffic zones (663).

TRANSPORTATION MODEL SYSTEM

Using detailed descriptions of a transportation system (speeds, distances, costs and travel times) this model simulates traffic patterns for different segments of a transportation network. The overall transportation model system consists of four individual sub-models: trip generator; trip distribution; mode split; and assignment.

The trip generator model estimates the origin and final destination of trips according to traffic zones. The model considers the numbers and locations of residences and places of employment. Identification of the transportation mode (automobile, bus, train) is performed by the mode split model. Identification is made of the type of trip including purpose, basic transportation characteristics, costs, time, and convenience, and of the user characteristics, such as income, age and occupation.

The final element of the network, to identify the route for each trip, is accomplished by use of the trip assignment model. Assignments are made on the basis of minimizing time and distance to a trip's destination.

Output from the transportation system model indicates the future patterns for transportation facilities. By indicating traffic densities and user facilities, it facilitates making policy decisions on existing and proposed facilities.

STRATEGIC AIR QUALITY MODEL

The Strategic Air Quality (SAQ) model describes future air quality based on fixed and mobile pollution sources, as well as meteorological characteristics. The Urban Development Model and the transportation model provide the input on the sources (fixed and mobile) to the Strategic Air Quality model. Once located, the dispersion of these pollutants throughout the region is examined by the Strategic Air Quality model, which then provides the expected regional pollutant levels.

THE PLAN EVALUATION METHOD (OR MODEL)

The final step of IREM is the Plan Evaluation Method. The previously discussed models provide details on population, housing, employment, land use, transportation and environmental quality. Using the output of all the models the Plan Evaluation Method related the data to predetermined criteria in order to identify those policies that produce the most desired situation and meet the plans for the San Diego Region.

CONCLUSION

The models explained above require a large computer system for their maintenance. Since the IREM model was designed for a specific region, another area would have to establish a data base before it would be able to adapt the model for its own usage.

The project has limitations that are not exclusive to IREM. The models require gross assumptions and accurate, reliable and current data. City, county and industry interests must work together. However, the model does integrate environmental considerations into the policy making process, is highly flexible to meet the region's needs, and is technically sound.

ARIZONA TRADE - OFF MODEL

The Arizona Trade-Off Model (ATOM) is an operational environmental management tool that analyzes economic growth versus natural environment policy issues. The model is designed to assess the impact of specific policy or program alternatives on the economy and environment of Arizona.

To measure trade-off, the model uses employment as a rough indicator for economic change and a composite index for measuring environmental quality units. The environmental composite index is derived using weighted scores for sixty-six variables representing environmental quality. The sum of the highest values for the sixty-six variables, or a perfect score of 1000, represents zero pollution as shown in Figure 2. This method allows for a crude quantitative measurement of environmental quality as well as integrating policy issues into the weighing scheme.

The ATOM has two distinct stages - an exogenous or external stage and an endogenous or internal stage. The exogenous stage allows for variables that are outside the model's determination to have a value assigned. The endogenous stage is the working ATOM model and uses the external factors to calculate a solution. The model is outlined in Figure 3. The final evaluation phase of the ATOM model uses the technique of simulation. Since internal variables may change and affect the final solutions, the ATOM is considered a dynamic simulation model.

EXOGENOUS STAGE

Before the actual trade-off solutions can materialize,it is necessary to determine the outside factors affecting the economy and environment. This is accomplished in the exogenous stage.

The first step is determining the specific public policy (Public Policy Sub-model) alternatives that are to be considered. The policy alternatives presently considered by the ATOM are economic growth, industrial structure, and environmental protection.

After the objectives have been specified, the Sub-model produces the types of programs to be implemented and the results associated with them.

Figure 2

I. Ecology (315 units)

A. Species and Populations (144 units)
  1. Rare and endangered plant and animal species (16)
  2. Productive plant species (16)
  3. Game animals (16)
  4. Other animals (16)
  5. Resident & migratory birds (16)
  6. Sport fisheries (16)
  7. Commercial fisheries (16)
  8. Pestilent plant and animal species (16)
  9. Parasites (16)

B. Habitats and Communities (96 units)
  10. Species diversity (48)
  11. Food chains (24)
  12. Land use for habitats and communities (24)

C. Ecosystems (75 units)
  13. Productivity rate (25)
  14. Hydrologic budget (25)
  15. Nutrient budget (25)

II. Environmental Pollution (321 units)

D. Water Pollution (160 units)
  16. Algal blooms (5)
  17. Dissolved oxygen (20)
  18. Evaporation (6)
  19. Fecal coliforms (5)
  20. Nutrients (12)
  21. Pesticides, herbicides, defoliants (8)
  22. pH (8)
  23. Physical river characteristics (6)
  24. Sediment load (15)
  25. Stream flow (20)
  26. Temperature (20)
  27. Total dissolved solids (20)
  28. Toxic substances (5)
  29. Turbidity (10)

E. Air Pollution (40 units)
  30. Carbon monoxide (8)
  31. Hydrocarbons (8)
  32. Particulate matter (8)
  33. Photochemical oxidants (8)
  34. Sulfur oxides (8)

F. Land Pollution (93 units)
  35. Land use and misuse (31)
  36. Soil erosion (31)
  37. Soil pollution (31)

G. Noise Pollution (28 units)
  38. Noise (28)

Figure 2 (cont.)

III. Esthetics (159 units)

H. Land (25 units)
  39. Land forms (15)
  40. Geologic surface material (10)

I. Air (11 units)
  41. Pleasantness of sounds

J. Water (39 units)
  42. Surface characteristics (25)
  43. Water-land interface characteristics (14)

K. Biota (28 units)
  44. Vegetation (18)
  45. Fauna (10)

L. Man-made Objects (21 units)
  46. Visual
  47. Condition (5)
  48. Consonance with environment (8)

M. Composition (35 units)
  49. Interaction of land, air, water, and man-made objects (25)
  50. Color (10)

IV. Human Interest (205 units)

N. Educational-Scientific Significance (64 units)
  51. Geological significance (18)
  52. Ecological significance (18)
  53. Archeological significance (18)
  54. Unusual water phenomenon (10)

O. Historical Significance (55 units)
  55. Related to persons (11)
  56. Related to events (11)
  57. Related to religions and cultures (11)
  58. Related to architectures and styles (11)
  59. Related to "western frontier" (11)

P. Cultural Significance (54 units)
  60. Related to Indians (18)
  61. Related to religious groups (18)
  62. Related to other ethnic groups (18)

Q. Mood-Atmosphere Significance (32 units)
  63. Isolation-solitude (8)
  64. Awe-inspiration (8)
  65. "Oneness" with nature (8)
  66. Mystery (8)

Source: Battelle Memorial Institute, Columbus Laboratories

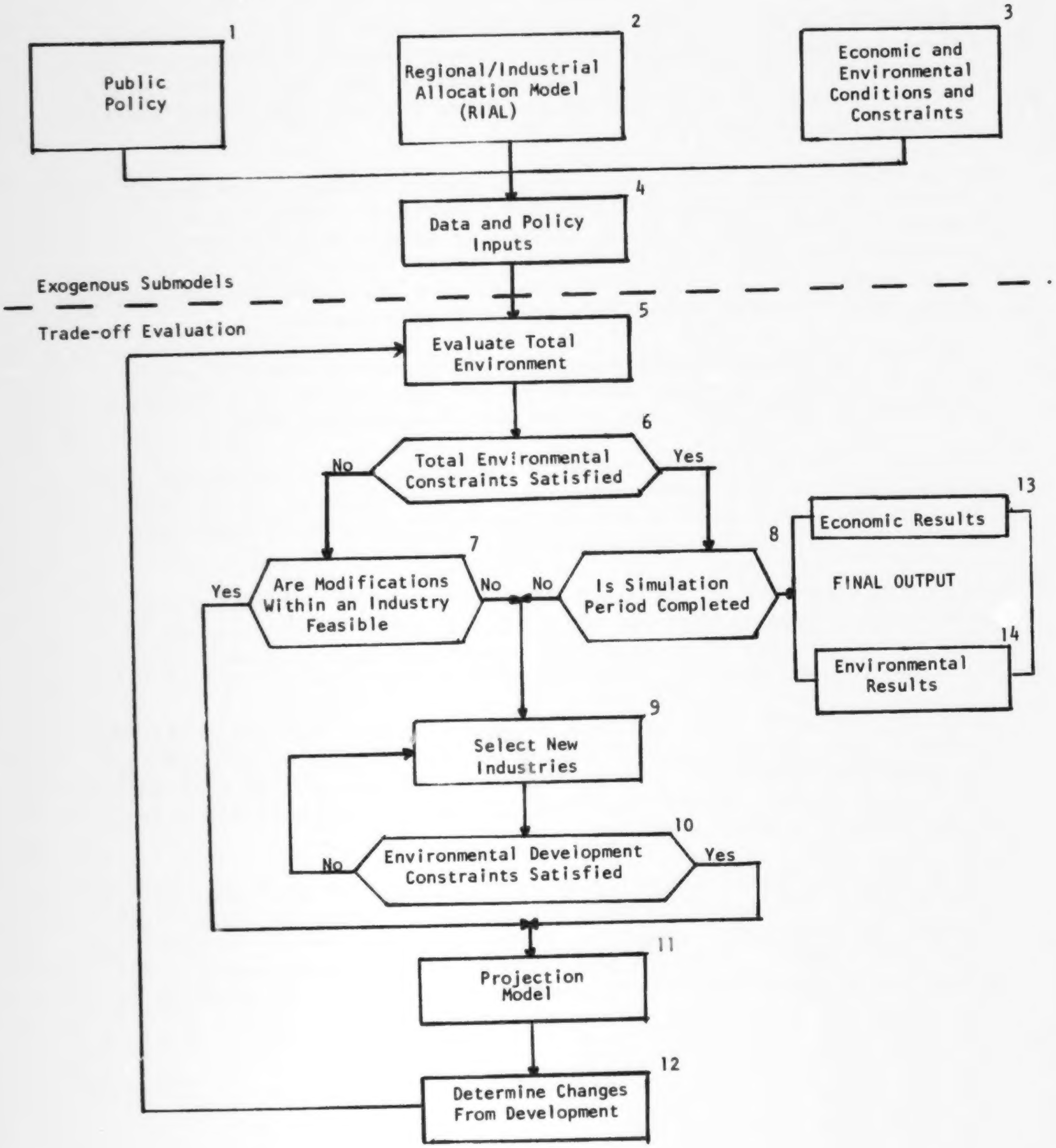

1
Public Policy
2
Regional/Industrial Allocation Model (RIAL)
3
Economic and Environmental Conditions and Constraints
4
Data and Policy Inputs
Exogenous Submodels
Trade-off Evaluation
5
Evaluate Total Environment
6
Total Environmental Constraints Satisfied
No
Yes
7
Are Modifications Within an Industry Feasible
Yes
No
8
No
Is Simulation Period Completed
13
Economic Results
FINAL OUTPUT
14
Environmental Results
9
Select New Industries
10
Environmental Development Constraints Satisfied
No
Yes
11
Projection Model
12
Determine Changes From Development

FIGURE 3. FLOW DIAGRAM OF THE ARIZONA MODEL

Additional exogenous factors are determined by the Regional Industrial Allocation Model (RIAL). The RIAL is itself an independent analytical model. Used within the context of the ATOM it evaluates the feasibility of industry location. RIAL produces a ranked list of new industries that may feasibly locate in a specific area. This ranked list is further used to evaluate economic growth and/or industrial structure.

Industry location is based on input factors such as existing industries, transportation needs and facilities, market locations, and labor force growth. Specific environmental factors that can be considered in RIAL are amounts of pollution generated and the water requirements for each type of industry.

Using what is described as an "input - output linkage," the model produces its ranked list by comparing industrial needs with area resources. The model does not attempt to establish likelihood estimators for each industry (i.e., a probability estimate to determine if an industry will locate) nor does it rank the industries to determine which industry would locate in a competitive situation.

The final exogenous factors necessary for operating the ATOM are economic and environmental conditions and constraints or a data base of economic, demographic and environmental characteristics.

All input data utilized in the ATOM are arranged in a map format using six by ten mile grid cells. Much of the economic data is available only at the county level and is therefore distributed through approximations to the sixty square mile grids.

The three exogenous stages supply data to the ATOM through a selection process that usually includes policy and program definitions and data base elements. The three exogenous stages are initiated only once with the results used for unlimited ATOM evaluations.

An additional data input which is necessary before initiating the ATOM are base line projections. These projections are future economic and environmental conditions upon which the policy and program alternatives are to act. The trade-off solutions of the ATOM are variations from these baseline projections.

Values for the baseline conditions are projected for each year of a ten year future. Estimates are made for population characteristics such as age, sex, education, minority representation, labor force participation, and economic structure described by industry employment. The estimates are made using the projection model (step 2 of ATOM) on an independent cycle from the actual evaluation.

ENDOGENOUS STAGE

The endogenous stage of the ATOM performs the trade-off evaluation. The model determines economic and environmental consequences that would be brought about by the policies or programs for a ten year period. However, provision is made for the model's user to select a time frame as small as quarterly.

For each policy-induced change, the model performs an evaluation of the total environment. The evaluation is actually a simulation of present development with proposed environmental constraints. Economic growth can also be predicted according to environmental constraints. Additional simulations can be made for testing the impact of a different level of economic activity and associated pollution vis-a-vis land use and pollution constraints.

Three options are available if constraints are violated. First, a different industry which is more suitable for the environment may be selected. Second, controls may be imposed on the industry to meet the proposed pollution levels. Third, new constraints may be constructed.

The model is able to evaluate environmental improvements. The industries most environmentally sound for a given area are taken from the ranked industry list provided by the RIAL submodel. Testing of an industry's suitability is continued with the introduction of pollution abatement methods and costs. Included in the analysis are the impacts of different policies and programs (e.g., abatement) and potential industry reactions (e.g., additional financing, passing on pollution control cost to consumers or cessation of operations).

Total industrial structure is examined by selecting new industries in the simulation phase. A new industry is chosen from the ranked list provided by the RIAL if a targeted growth rate is different from the exogenously determined baseline growth projection. The determination of whether an industry can be located in a given location depends upon the economic growth objective.

The final endogenous step is the projection cycle. This is the same submodel that works independently to provide the baseline projections. Used within the ATOM framework, the submodel provides estimates of migration rates as a function of economic conditions and employment opportunities. The projection step also estimates economic activity. Estimates are made for industry export activity (as a source of income flow into an area), employment growth via a multiplier effect for each type of firm in an area, and population and households. Employment is used as a measure of economic impact in the model.

ANALYSIS

Two of the more important aspects of the ATOM are land use and resources analysis. Land use is analyzed for each six by ten mile grid cell for the state. Each grid receives a general classification of its surface resources, a distribution for the major types of activities, and a description of the grid's attributes.

The major surface resources are described by the eleven classifications of: surface water; riparian; urban land; cultivated and pasture; coniferous forest; grassland; woodland; chaparral and mountain brush; northern desert shrub; non-urban highways and airports; and southern desert shrub.

Human activity is also described. Items such as urban settlements, recreational facilities and activities, agricultural activities, and mineral extractions are used to relate human activities to land attributes. The land attributes that are considered include: land ownership, mineral deposits, game birds, and recreational demands. Items such as recreational demand, that change over time, have detailed computations made on the activity in each cell.

The analysis focuses on environmental quality and calculations are made for changes that would occur because of industrial emissions or increased population. Water and air effects are traced from cell to cell until they are dissipated.

The Arizona Trade-Off Model is extremely complex. There are various internal effects and interactions that are impossible to trace in a summary type paper. However, the model is providing environmental managers with information needed to establish policies and directions.

The model does have many limitations in its built-in assumptions, exogenous needs and simplistic causalities. But the model is a beginning for rational environmental decision making.

GENERAL ENVIRONMENTAL MODEL

The General Environmental Model (GEM) is still in the development stage. When completed, it will provide policy analysis and strategies for responding to urban problems and issues for use by policy and decision makers. (GEM is to be an Urban Policy Model.)

Basically, the GEM provides information for urban-environmental policy evaluations. Using specific policy criteria as input, spatial and temporal distributions are the output. The model includes various physical, economic and social indicators and uses interrelationships to provide secondary and tertiary effects.

One of the more important aspects of the GEM is the quality of urban life indices. Indices are provided for pollution, housing quality and costs, quality of public services, and public preferences for goods and services. Presented as levels of dissatisfaction, the indices induce change and allow for more complete interrelationships to occur.

The GEM, when completed, will consist of various subsections to meet the needs of a variety of users. Unlike many models, the GEM is not being designed for or by a specific municipality, which would require various modifications if the model were to be used by other cities. Rather, it is to be a general policy model, designed for a specific task, which can be used by anyone.

DATA BASES

The GEM requires an extensive data base that, like most, requires a great amount of time and expense to construct. The model's data input will have three basic characteristics. First, they will be displayed spatially on a grid with 625 squares, each square representing one square mile. However, the grid may be clustered into jurisdictions with input correlated to jurisdictional boundaries. Second, the data input will provide description of natural, physical, human, and monetary resources. Third, the data will be adapted to fit the system behavior of economic, social and government sectors.

The general data categories include: topographic and geographic, land use and zoning, transportation network, housing and population density, levels of public and private sector activities, and monetary conditions.

To save time and expense for a user of the model, representative situations are under development. To test the impact of a policy decision there will be nine model data bases representing 221 Standard Metropolitan Statistical Areas (SMSA) known as Modal Cities.

As an alternative, there is a data base generator, known as the Simulation City model, under development.

MODAL CITIES

The modal cities provide GEM users with a standard urban area's data base. There are nine basic types of modal cities defined for use. Type A consists of very large, highly-developed urban areas with important manufacturing sectors. Type B is highly specialized in recreation, with rapid growth and high income. Type C contains the medium-sized areas with a relatively smaller service sector, emphasizing distribution and some manufacturing. Type D areas are affluent and growing, but less highly urbanized. Type E represents less well-to-do areas with elderly populations. Type F are traditional New England with relative stagnation, lack of wholesaling and an absence of Blacks. Type G are nonmanufacturing with rather high levels of poverty and many Blacks. The Type H areas are archetypal Midwestern, stressing manufacturing, somewhat smaller but growing. Finally, the I group are reasonably affluent, medium-size regional centers, individually specializing in a variety of functions. Representative areas for the nine classes are shown in Figure 4.

SIMULATION CITY

The Simulation City (SC) model will assist the GEM users in preparing a regional data base. The model will utilize descriptors for a specific SMSA to generate a detailed data base to meet the requirements of GEM.

Required inputs to the SC model are metropolitan area descriptors, either explicit (e.g., population) or subjective (judgments), and topology descriptors (roads, rivers, non-developable land). These inputs provide limitations for the ongoing simulation.

The actual simulations provide a data base by using location and economic theory. For example, industries are located near transportation sources, and distances are minimized for households and services. While detailed area information can be used to generate the data base, the SC model is designed to use readily available information (from the statistical abstracts and United States Geological Survey (USGS) topographic maps).

DECISION INPUTS

The GEM will have decision simulators for economic, social and governmental sectors. Presently only the Economic Decision Simulator (EDS) is under development. The simulators utilize decision trees to assign probabilities to specific courses of action based on past success of those actions.

FIGURE 4

Model Cities Suggestions

Type A

- Philadelphia
- Cleveland

Type B

- Las Vegas
- Reno

Type C

- Kansas City
- Dallas

Type D

- Phoenix
- Orlando

Type E

- Knoxville
- Ashville

Type F

- Lowell
- Worcester

Type G

- Mobile
- Savannah

Type H

- Saginaw
- Rockford

Type I

- Tulsa
- Tacoma

The GEM user can plan actions for economic activities with information provided on economic patterns. The simulator examines the economic sector with respect to new business formation, land use allocation, economic growth, business operating decisions, business expansions, and provides input to the social and government sectors. The decision simulators will limit the number of inputs required by the GEM user.

The simulators are an independent sub-model of the GEM and therefore allow the user to modify or substitute decisions before final processing. The decisions available to the GEM user are shown in Figure 5.

GEM MODULES

After the data base has been established and the decision inputs made, the final processing through the GEM can be accomplished. Four GEM modules provide a basic system framework and user evaluation of goals and needs.

The Social Module contains population groups broken into socio-economic classes, population characteristics and population needs (housing quality, school quality).

The Economic Module presents basic economic activities (industries and services) and describes economic needs, business transactions, growth, and economic and environmental effects.

The Government Module describes the public and semi-private activities that serve basic governmental services. These include: budgets, tax rates, assessments, zoning, public safety and welfare services, utilities, education and transportation.

The Environmental Module represents fuel, power and water consumption; the generation of consumption and industrial processes pollution; and pollution treatment activities. Also included are secondary pollution effects.

OPERATIONS

The last stage of the GEM determines the system behavior through the interrelationships of allocated resources via the GEM modules and the effects of the decision inputs.

There are eight operations in the final calculations: population shifts are determined through dissatisfaction indices; developments are depreciated with calculations made for maintenance expenditures; full and part-time workers are assigned jobs by ranking their education achievements and maximizing their net salaries; total transportation costs are minimized subject to public transit capacity, road congestion, and

Figure 5. Decisions Available to Users of the Model

1. Economic Decisions
   - . buy and sell land
   - . set rents
   - . set prices
   - . set salaries
   - . set maintenance levels
   - . lend money
   - . borrow money
   - . build and demolish three types of residences, twelve types of basic industries, and four types of commercial establishments
   - . transfer money to other economic and social and government decision makers
   - . boycott commercial establishments
   - . construct chlorination, primary, secondary and tertiary effluent treatment facilities at basic industries
   - . change the operating level of a business (without demolishing the building)
   - . set the amount of water which is recycled at basic industries
   - . construct residences which use ground water
   - . set the fuel mixture for an economic activity
   - . contract between a basic industry and a solid waste company for solid waste collection
   - . convert an industrial open dump into usable land
   - . install and remove three types of air treatment at a basic industry
2. Social Decisions
   - . allocate time to extra work, education, politics and recreation
   - . boycott work locations, commercial establishments, and modes of travel
   - . set the dollar value of time travelling to work
   - . transfer money to other social, economic and government decision makers
3. Government Decisions
   - . grant appropriations
   - . grant subsidies
   - . transfer money to other government and social and economic decision makers
   - . set welfare payments
   - . set tax rates
   - . float bonds
   - . assess land and buildings
   - . buy and sell land
   - . set the number of job openings in government
   - . set government service districts
   - . request Federal-State aid
   - . set the salaries offered government workers
   - . build and demolish schools
   - . build and demolish municipal service plants
   - . grant contracts with local goods and service establishments for government purchases
   - . set the amount of public adult education offered by the government
   - . construct and demolish roads
   - . construct and demolish terminals
   - . zone land
   - . build and demolish public institutional land uses
   - . provide parkland
   - . install water and sewage lines
   - . construct and demolish water and sewage plants
   - . locate bus routes
   - . buy and sell rail rolling stock
   - . locate rapid rail routes
   - . set the amount of service on bus and rail routes
   - . set the maintenance level of government facilities

Figure 5. Con't.

- set prices for private use of publicly-provided water
- construct and demolish primary, secondary, and tertiary sewage treatment plants
- construct and demolish water intake treatment plants
- locate municipal water intake points
- locate municipal sewage outflow points
- locate water sampling stations
- change a business' operation level (without demolishing the building)
- build and demolish nuclear and fossil fuel power plants
- set fuel mixtures at fossil fuel power plants
- set fuel mixtures at schools
- set fuel mixtures at municipal services
- build and demolish cooling towers at power plants
- install and remove air treatment at fossil fuel power plants
- set power prices
- create land fills
- convert land fills into usable land
- contract between a basic industry and a Solid Waste Company for solid waste collection
- contract between a Solid Waste Company in one jurisdiction and that in another jurisdiction for use of the other's land fill site
- set solid waste collection fees
- build and demolish incinerators
- install air treatment at incinerators
- assign parcels to incinerator districts
- establish ambient air sampling stations
- establish point source air sampling stations
- set air and water pollution fines
- set air point source regulations
- buy and sell buses
- set bus and rail fares
- build rail lines
- build rail stations
- assign parcels to land fill districts
- raise local air ambient standards above national standards
- implement motor vehicle pollution emissions regulations

transportation boycott constraints; school quality and capacity are used to allocate students by districts; each population unit is allocated time for education, politics, recreation and employment; personal goods and services and business goods and services expenditures are allocated by minimizing total costs; and final calculations are made for indicators, incomes and expenditures.

OUTPUT

There are four output modes to the GEM: maps, indices, detailed information, and summary information. The map output provides visualization of economic activity, transportation networks, municipal services, land use, planning and zoning, and market values. Information is provided for each of 625 grids in a detailed format of economic and demographic uses.

Indications about quality levels are provided by indices. Indices are provided for: pollution (air and water quality); neighborhoods (housing, rents, schools, tax rates, and services); health (crowding, bacteria counts and services); and time (involuntary, transportation and recreation).

Detailed information is available to examine the exact functional relationships of the model. Economic activity, pollution levels, financial operations, and employment selection can be developed in detail.

Summary information is provided by descriptions and graphs for every major economic, environmental, social, and governmental activity processed by the GEM.

CONCLUSIONS

The GEM will provide a user one-year cycles to determine the present status of an urban area's resources and policy effects on those resources. The model can, through iterations, examine urban area effects brought on by various policy changes. The model is basically concerned with the allocation and reallocation of systems resources given the effects of various policies and their implementation.

The model is an attempt to provide policy and decison makers the capability of analyzing urban-environmental issues. Using a systems simulation, policies can be examined in detail as to their effects, and workable solutions and alternatives may be suggested.

THE STRATEGIC ENVIRONMENTAL ASSESSMENT SYSTEM (SEAS): A RESEARCH PROJECT

Dr. Stanley M. Greenfield*

I am pleased to discuss with you this morning a research project underway in my office to develop a Strategic Environmental Assessment System, known as SEAS. This project is particularly appropriate in the context of this conference and especially within the scope of this session on Environmental Technology. As you will see, the SEAS project is based upon the fundamental premise that modern computer technology, when combined with expert opinion, can if applied properly be of significant value in assisting public decision makers at all levels of government in understanding the complex interrelationships of the environment and the less apparent consequences of our current and contemplated policies and actions.

The EPA is charged to carry out a program that will result in the protection of the environment of the nation by abating or avoiding pollution. Currently, this program is primarily regulatory in form. In response to this charge, the program of my office is structured so as to emphasize the accomplishment of the following six major goals:

1) The development of appropriate science and technology for setting and enforcing pollution control standards;

2) The full understanding of the environmental impact of that which we are mandated to control;

3) The knowledge of what it "costs" to meet environmental quality standards;

4) Knowledge of the "costs" of not meeting environmental standards (i.e., the benefits to be derived from meeting them);

5) Monitoring, to meet environmental goals; and

6) Establishing the means to forecast the long-range effects

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*Presented by Dr. Stanley M. Greenfield, EPA Assistant Administrator for Research and Development at the National Conference on Managing the Environment.

of societal actions so as to avoid deleterious environmental impacts.

The SEAS project is primarily focused on this last goal and is primarily concerned with developing an improved capability to strategically assess the comprehensive and long-range environmental effects of various policies upon society.

It is clearly recognized that the acquisition of such a capability involves a number of very difficult obstacles. In this connection it is instructive to consider a number of the more apparent problems that beset any such endeavor.

First, there is the critical issue of uncertainty. No one factor exemplifies this issue more than the attempt to predict future technological trends. Technological trends are perhaps the most critical component of any forecast of the future, but also the most difficult to assess. The institutionalization of R&D efforts has, to some extent, alleviated the problem of anticipating new technologies, but the nature and timing of technological "breakthroughs" and, more importantly, the rate of implementation, remain subject to many unpredictable factors. One thing we have learned is that there is wide variation in the rate of adoption of new technologies.

A corollary issue with respect to technological forecasting is predicting impacts upon society. We know from experience that institutional and social factors and values are fundamental to environmental quality , yet our ability to predict such changes is equally difficult. For example, assessing the first-level impact of new technologies upon the economy is problematical in itself; but predicting the secondary effects of technology on human life styles, urban form, and behavioral patterns and values is extremely complex.

Secondly, we face the issue of the interrelationships of factors and the nature and degree of interaction. It is obviously not sufficient to state that environmental factors are related to each other. What is important is to acquire better knowledge on the "why" and "how" of these relationships. Central to this problem of interaction is the nature of the driving force and the resulting perceived environmental system. As we all know, the status of the environment depends upon a complex series of actions and inactions at all levels of government, industry, natural processes, and human behavior, to name but a few. Such actions occur in a highly decentralized fashion. Those of you with responsibility for environmental management know well what your sphere of influence involves -- whether it be geographical, jurisdictional, legislative or economic. Thus, from the perspective of prediction or forecasting, major problems are faced in terms of measuring both the nature of these decentralized actions and, perhaps more importantly, their interrelationships.

All forecasting starts from the premise that there are certain continuities running through the past and present into the future, and that the reactive or response type of decisions can be assumed to have relative relationships. In predicting environmental consequences of policy choices, the assumption that a first order forecast is a simple extrapolation may be inadequate, because the complexities and subtleties of the interactions are simply not well understood, and the multitude of unforeseen branchpoints downstream preclude this type of approach.

Another difficulty in forecasting involves the risk of deceptiveness of short-term considerations. On the one hand, such a risk justifies the need for long-range forecasting, since assumptions made about the nearterm future are often spurious with respect to the longer-run ramifications, which may be irrevocable. In practice, however, the complexities to be dealt with in forecasting are normally assumed to be of one form or another based upon our best estimates of the future, which usually amount to short-term considerations. Thus we have a double-edged sword -- we are continually faced with the need for long-term forecasting but constrained by near-term comprehension and understanding, coupled with the demand for near-term decisions.

Furthermore, we must consider the issue of validation. Assessment of the implications of policy choices is critical to effectiveness, and the quality of our techniques for conducting such assessments is fundamental to the process. There is much information in the literature describing the problems and needs of validation, but the state-of-the-art is imperfect. Essentially, one must be continuously conscious of the issue and strive to improve the methodology as experience is gained. Effective forecasting of the past to the present is a minimum test of validation, but by no means sufficient, primarily because our models, drawing from past experience, are expected to optimize such forecasts.

In summary, there are difficult and complicated problems involved in forecasting. These must all be taken into account and internalized as one attempts to develop a capability for strategic assessment.

On the positive side, however, there are numerous significant benefits to be gained from attempting to forecast future problems. From a policymaking point of view, the ability to consider the likely long-range and comprehensive implications of policy choices can contribute substantially to policy effectiveness.

First, one can have the benefit of organization of thought. Strategic assessment requires structuring choices, considering ramifications and attempts at predicting impacts, all of which demands some set of rational criteria by which policy choices can be evaluated. The concept of "alternative futures", or the consideration and evaluation of alternative states of the environment, is one such example. With an effective forecasting capability, one can develop certain scenarios within the general limits of expected growth trends or patterns and evaluate the likely outcomes or impacts upon environmental quality. Only by organizing and bounding the possible futures can one rationally consider alternatives for growth policies.

Another benefit is the ability to help move environmental policies in the direction of protection. With an ability to foresee long-range pollution problems, in an "early-warning" sense, one can consider corrective actions in the interim to protect rather than only to regulate or penalize. Thus new policy options are surfaced which may have been overlooked. Policies in the areas of incentives, land use planning, risk avoidance, and conservation, for example, may be shown to be of greater long-range value or, alternatively, shown to be of little overall consequence, if not counter-productive in certain respects.

Effective strategic assessment can also assist environmental managers in decision making. As some of the speakers at this conference are pointing out, we can no longer assume that the natural abilities of the market place and our behavioral patterns will self-correct, or, in other words, automatically turn the environment around toward quality. Rational consideration of various management strategies and actions is necessary before problems result from poor or non-existent planning. In particular, our technological and institutional solutions need to be broadened to include the long-range effects of our actions or inactions. In this context, forecasting within a comprehensive framework can assist the management of policy making.

One example of this concept is the ability to use forecasting as a means to track progress in reaching goals. For instance, a growth policy may be established which is designed to reach a long-range goal of a specified quality of life. Forecasting techniques can then be applied periodically to assess the actual progress being made over time toward achievement of the goal. In this way, mid-course corrections can be made in the policy or, if necessary, in the goal statement.

In a similar fashion, one can measure the impact of alternative policies. For instance, if a mid-course correction were implied, a set of alternative growth policies could be tested at that point in time and evaluated according to their relative impacts upon the environment and thus their projected progress toward reaching the stated goal. In this way, the forecasting system would be sensitive to perturbations in that progress, for example, unforeseen value changes, and would highlight those areas in need of modification.

It is clear that one does not have to produce a perfect forecast system in order to obtain many of the above benefits. Let me now highlight a few of the characteristics of SEAS which is being designed in general to acquire the previously mentioned benefits.

First and foremost, SEAS is a research project. As such, it is time-phased in its development cycle. The research plan revolves around our ability to synthesize the available state of the art in techniques and methods for assessing long-range comprehensive pollution problems.

SEAS has a number of attributes, the collection of which differentiate it from other models and systems which have been attempted in the past. Some of these are as follows:

1) SEAS will deal explicitly with pollution generators and possible controls and known effects of residuals;

2) It is to be a national-level model system for use by EPA Headquarters and Regional policy makers;

3) It is to have a ten to twenty year time horizon;

4) It will make use of "official" environmental, economic and demographic data;

5) It is to be used together with expert opinion to maximize the combined man-machine capabilities; and

6) SEAS will project the state of the environment and socio-economic systems in the ten to twenty year planning period that would likely result from alternate projects of population growth, technological change and economic activity levels, and the effects of environmental policies in a comprehensive context.

Thus, SEAS is to be a complex model system, attempting to tie together in a comprehensive sense the interrelated areas of environmental and socio-economic factors.

At this workshop, you will be able to learn about the progress made over the past six months on the SEAS Test Model. This test model is being done as a research tool for the development of the SEAS Prototype Model that will be completed by December and used to prepare a "1980 State of the Environment" projection. The prototype will be a state-of-the-art system insofar as it will incorporate the best available submodels into the comprehensive SEAS context. We are now in the process of surveying various federal and state/local agencies, research institutes, universities, and private firms for the most appropriate set of techniques and data bases for the SEAS Prototype. One of the final products of the SEAS prototype effort will be complete documentation of the effort and an estimate of what benefits and costs would be incurred from proceeding further toward the full SEAS system.

Let me now mention briefly some ideas we have for the applications of SEAS when it is developed.

Initially we envision SEAS aiding in the assessment of alternative policies in terms of their long-range impact on the environment. This use we view as a "process", whereby SEAS, as a computer-based system of models, will be augmented by human expert opinion in an integrated analytical fashion. State of the Environment Reports can be produced, which result from man-machine analysis of the long-range ramifications of current and contemplated environmental policies upon the Nation and Federal Standard Regions.

This initial use could also involve assisting us in the illumination of possible research goals and needs. If it is possible to describe the environmental system, it may then follow that sensitivity tests may help in identifying potential gaps in the sense that our information in certain areas may be lacking and the particular gap may be more important than we thought. Our goal of a better understanding of the way the total environment interacts with itself, with man, and with all the elements that go to make it up, may be broken down, with the help of SEAS, into relative critical components with varying research needs.

Ultimately SEAS could be helpful in formulating policy choices and in monitoring the overall progress of the Nation or region in reaching policy goals. Obviously this will require effective solutions to the forecasting issues I mentioned earlier. But we are hopeful that development of the Prototype will indicate that it can be done, because this is the most effective way we can hope to anticipate long-range problems and to take proper actions to prevent them from occurring. For instance, we know from experience that the problems we face today are not necessarily those we will face at some time in the future. This is the principal reason that technology alone rarely solves problems. Institutional and societal factors and values really determine the success of proposed solutions. With an effective forecasting system such as SEAS we may have the capability to consider new policy options and assess their ramifications upon the total environment.

Finally, I want to suggest to you that the concept and process underlying SEAS is directly applicable to your organizations and objectives. As you move toward a more comprehensive and integrated view of managing the environment, the process of organizing and synthesizing the best available information to consider alternative policies can be extremely beneficial as a management tool.

We believe SEAS is a very worthwhile research project. It is being developed carefully and documented completely and I encourage you to follow its progress and take advantage of our experiences. Since we have the same environmental management goals, our techniques and methodologies should be shared.

THE DEVELOPMENT AND OPERATION OF A PROTOTYPE STATE ENVIRONMENTAL INFORMATION CENTER

Dr. Robert V. Garner*

The Oklahoma Environmental Information and Media Center (OEIMC) was established by action of the Oklahoma Legislature and the Oklahoma Regents for Higher Education. Its purpose is to provide an environmental knowledge base for all interests in the state, including business and industry, education, government, and the public.

Action establishing the center was taken after a state-wide environmental action plan study indicated that one of the most pressing environmental needs concerned environmental information and data. There was no central authority or source upon whom the potential information user could depend for current, factual environmental information. Locating and acquiring much needed information was beyond the operational and financial capability of a majority of Oklahoma users.

The original state funding for the first year of operation was supplemented during the second year by grant funds from the Environmental Studies Division of EPA. The federal funds allowed continued development of the center.

IDENTIFICATION OF NEEDS

Needs were defined by target groups within two broad categories. The categories were (1) short range, i.e., problem solving, enforcement, training, etc.; and (2) long range, i.e., educational, continuing research, public information, etc. The first category, Short Range Needs, includes the following areas: (a) environmental management information for small industry and local government; (b) environmental information required by local and state government agencies for enforcement measures; (c) environmental training materials required for industry and governmental training programs; (d) environmental information necessary for the research activities of industry, academia, and government; and (e) general environmental information solicited by the public on significant environmental issues.

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*Presented by Dr. Robert V. Garner, Director, Oklahoma Environmental Information and Media Center, East Central State College, at the National Conference on Managing the Environment.

The second category, that of Long Range Needs, includes the following areas: (a) environmental information for curriculum building -- an urgent need in both public and higher education; (b) general environmental information sought by special interest groups and others engaged in support of environmental quality efforts; and (c) environmental information for the planning activities of those governmental and industrial representatives charged with creating future environmental quality programs.

BUILDING THE BASE

Once the needs were defined, an effort was made to identify information/data bases containing environmentally related materials, and to find ways to tap those bases. Caution was taken to avoid duplication of effort. The following steps were taken: (1) Arrangements were made to allow direct access of OEIMC information personnel to the Robert S. Kerr Environmental Research Lab Library, the East Central State College Library, and other libraries with appropriate holdings; (2) Acquisition of selected environmental documents and materials was begun. Formats included hard-copy documents, microfiche, abstract listings, films, film clips, slides, etc; (3) Contract and liaison arrangements were made with other information centers to receive selected environmental materials in microfiche format on a monthly basis; (4) Subscriptions to a number of document abstract sources were initiated; (5) Subscriptions to periodicals, newsletters, journals, etc. were initiated; and (6) A referral list of environmental expertise was begun.

SEARCH AND DELIVERY TECHNIQUES

Though computer searches are available under some of the contract arrangements, the cost factor with current budget level is virtually prohibitive. Therefore, virtually all information searches are performed manually by environmental science students.

Delivery techniques vary considerably. The key word is service, and the center tries to provide a service in answer to all requests for information while also using media methods to disseminate environmental information. Briefly, there are five kinds of services:

(1) Problem or question oriented requests.
Such requests may be handled by phone, mail, or in person. They vary in depth from questions which can be answered immediately from reference materials to some which may require search of thousands of document titles and abstracts.

(2) Field Service.
The field service is designed to provide a direct interface with the local government and small industry. The field representative is available to inform potential users of the

center's services, assist in obtaining access to the center's resources, and on occasion, advise the user on applying the information.

(3) Public information education displays.
Directed at informing the general public, this method is employed by setting up displays at environmental, scientific, educational, and industrial meetings around the State.

(4) Publication of periodicals and fact sheets.
OEIMC publishes "ECO SYSTEMS", an environmental periodical, eight times per year, and produces fact sheets on environmental subjects for mail outs and for handout at meetings, etc.

(5) Use of news media.
With an experienced newswoman on the staff, OEIMC makes frequent use of newspapers. The TV and radio media have also been used on a number of occasions.

FUTURE DIRECTIONS

Even though manual search techniques have been proven more relevant and effective than computer searches, the increasing volume of requests necessitates the use of some automation.*

Since the advantage of the manual search results from the individual's ability to scan the text of an abstract or article, OEIMC studied several automated systems advertising free text search capability. All but one of the systems studied require a large computer and considerable software. The one system which did not require a large computer showed the most promise. Based on a special purpose machine employing a hard wired associative logic, the system will search on word combinations or whole phrases. Limited software is required for storage, none for retrieval of free text. It is accessed by keyboard, it is compatible with most computer systems, and it can accommodate remote terminals. Cost per query is lowest of all systems studied. Of four units in the world, only two are now in the U. S. One is currently on loan to OEIMC. Plans are under way to purchase a complete system with peripheral equipment to allow service to the entire state.

*NASA Report NASW-2085 - A Study of NASA Literature Search Strategies, and NASA Report NSR 37-004-008 - Technology Utilization in a Non-Urban Region.

COMMUNICATIONS IN ENVIRONMENTAL MANAGEMENT

Rodman T. Davis*

In the New York metropolitan area we are working on a project which involves both technology transfer and environmental management, primarily as it pertains to the techniques of telecommunications. Specifically it is a television system that was built by the Metropolitan Regional Council in the last several years.

The metropolitan regional council is a small voluntary council of governments serving essentially a tri-state, twenty-two county metropolitan area, 8000 square miles in size, with a population base of 18 million people. We have 550 general purpose governments, and another 800 special districts. This is an extreme example of jurisdictional and administrative fragmentation. It is a type of fragmentation similar to other large metropolitan areas, particularly in eastern parts of the United States.

The Council of Government concept is fairly well known. Essentially, it is an attempt to fill the vacuum which has developed in relation to intergovernmental relations and Constitutional definition of what states, local governments, and the federal government do. With the exception of the Metropolitan Council of the Twin Cities, Councils of Governments are still tentative, administrative mechanisms designed to improve coordination between jurisdictions in the metropolitan area.

A few years ago our organization visited with a county in New Jersey. They were deliberating about putting in closed circuit television in a court system. Anyone who has ever served on jury duty in the last two or three years in a court system in a large city probably appreciates the problems faced in these systems. There is an incredibly inefficient and counterproductive use of peoples' time and energies. Since closed circuit television between buildings and between court systems is feasible, the possibility exists that communications technology may be used for improving the flow of information between jurisdictions, between administrative agencies or between administrators in a large metropolitan area.

In 1969 we prepared a brief feasibility study of the present state of the art in closed circuit television technologies. It was not sponsored by the central research and development oriented federal agencies or foundations which have stated interest in communications. Rather, the sponsor was a regional office of a federal agency which was aware of the lack of coordination between and among jurisdictions in the area of, among other things, the environmental management problem.

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*Presented by Rodman T. Davis, Director of Planning, Metropolitan Regional Council of New York City, at the National Conference on Managing the Environment.

The results of the study indicated that there was a technology, known as ITFS (Instructional Television Fixed Service). This is a technology of microwave television, whereby the signal goes through a converter, into a dish antenna kind of configuration, and then through the air by line of sight ten, twenty, or thirty miles, depending upon topography, and is received by a dish and converted back to a television set.

The Federal Communications Commission (FCC) opened about thirty-one channels in the 2500 megaHertz frequency about 1963. Construction of the first systems began in the mid-1960's. For instance, in 1964 there was one that started in Mineola with six schools tied together. Then universities instituted a system in, for example, extension courses for engineering students, whereby they could stay in their factory or their firm and take courses during the working day or in the late afternoon, with some kind of audio talk-back capability.

Then it spread into the hospital world. Massachusetts General Hospital has a system linking the teaching hospital, the veteran's hospital, and Logan Airfield. Some of the medical schools have also used this technique and a police system has initiated a microwave system.

Our role in relation to environmental management is to try to improve the collective decisions and improve the flow of information between a large host of federal, state, and local agencies which have specific missions in the environmental protection, environmental planning, and the administration of environmental control programs.

After selecting the system, we contacted the FCC. Basically, we proposed to build a closed circuit TV system which would link the administrative headquarters of the major counties and some of the major cities in the metropolitan area. That was the concept. It included two-way communication. This had not been done through the traditional use of ITFS closed circuit television which was primarily classroom instruction. Initially, we had a problem in soliciting participation from a builder and a system designer. Prior to that, we had to contact the FCC and explain that we were not a school district, but rather a Council of Governments, and that we were interested in governmental management and in improving the programming of governmental programs. This did not necessarily fit into their traditional categories of licensing.

However, since the school systems had not used up all the channels in our metropolitan region, the timing was in our favor, and the FCC said, "Sure, try it out. It might work." We were able to get the authorization to go ahead with seventeen points in the metropolitan area in September of 1970. At that point, we started to prepare fairly detailed path surveys. If you intend to use the microwave type closed circuit system, you need either a mountain or a tall building to provide unobstructed paths between points. It is meant to be a fairly cost-effective technique as opposed to cable, which may be a very expensive way of getting television, either one-way or two-way, between points. We selected the 110-story World Trade Center and moved in during September 1971.

At this point we were surprised to receive only three fairly good bids on this system. Two of them were general contractors and would farm out different pieces of the system. We found few people who could design, package, and deliver a bi-directional or interactive closed circuit television system oriented towards governmental management.

The firm which had the most experience in total systems was selected and construction began in June of 1972. A construction strike in New York City slowed us down, but we were successful in obtaining nine closed circuit facilities built into governmental office buildings, primarily county headquarters, during the summer and the fall. The dishes and the antennas on the roof of the Trade Center were placed in the winter. Presently, the system is about ninety-nine percent complete.

We are scheduling initial test transmissions in June of 1973 when we will be able to call a meeting of the air pollution administrators at the county, state, and federal level. They can collect around the various points in the region -- White Plains, Mineola, Newark and New Brunswick, for example -- and have a live, two-way, bi-directional discussion.

There are several related potential uses for the system. First, each of these trunk systems could feed out in an omnidirectional pattern to branch offices, like borough halls or village halls, fire stations, police stations, hospitals, and neighborhood community centers. It has a networking capability, but it is not broadcasting. Unlike the entertainment industry, large numbers of people are not involved. Secondly, there is the potential for relating material from the microwave system to a cable television system.

Related to this technique is the potential for facsimile transmission, as well as for data transmission. Our strategy, though, was not to get involved with data transmission systems at present but to concentrate on a management teleconferencing technique, which would bring the decision makers at the state and the local government together on a periodic, real time kind of basis where we could have them continue monitoring specific progress and specific projects within their administrative purview.

We learned several things. One is that local governments will respond to the offer of communications technology only when they believe that they can have some control over it. Local governments, particularly smaller local governments, are very reluctant to buy a system which "comes from above."

Secondly, we learned that bi-directional television is probably profoundly different than what we usually think of as television. We are used to being only the receiver of a television image. This is a problem when you start putting people in rooms connected by bi-directional television. The predisposition of many people to perceive these systems as entertainment must be overcome.

Thirdly, although you may offer the most beautiful system on paper, most people will not buy into a system on the basis of the description. Government officials want to see how the communications system works, and see what the mayor of the other town got out of it, before committing their own resources.

There are four general kinds of barriers that we experienced in the three years from conception to actual construction. First, the potential users and the local administrative agencies often lack an understanding of how to effectively utilize a new communications system. They need time and assistance to discover how to make the system responsive to their needs.

Second is the inadequate financing techniques for aggregating markets. We are basically running a user-oriented, user-paid system. Each local government will contribute $14,000 per year. We are not billing per hour nor per minute. Beware of "on the shelf technology." Although it may be available, it also may be left over from a previous era of application. In our particular case, much of the hardware we are working with is instructionally oriented, that is, teacher-pupil oriented. This is logical, because it was organized initially for use by school systems. However, when fifteen mayors, for example, are talking about recent sulfur dioxide regulations of the state environmental protection agency, they are going to make different demands on the system than students and teachers.

Another barrier is that communication system designers and manufacturers have a propensity to work with large systems. The users, particularly managers and administrative users at the state and local level, think in terms of small increments of investment and small steps toward progress rather than in terms of systems. In addition, implementing a large system extends the time lag between system design and system utilization. We might have approached the problem by exploring the possibility of obtaining a two-way TV set in front of every one of the 550 local governments. This would be a total system concept. Instead, however, our approach was to install the system in ten major counties and cities, and demonstrate its operation to area mayors and managers.

Finally, in terms of television as a technology, we found a need for more transparent kinds of systems. In other words, if the hardware in any way impedes or gives the impression that it is limiting the dialogue or the bargaining or the debate, it becomes less useful and less flexible for the administrator.

Ours is a time-shared system which means that we are going to be opening up different kinds of relations between jurisdictions and departments of one kind or another. This creates some difficulties. For instance, law enforcement agencies sometimes fear sharing the system with other departments.

Finally, we attempted to build a flexible system that could tie into other communication systems, such as cable, and could adapt to new systems as they may be developed.

In conclusion, we found that local governments are bombarded with all kinds of either contradictory or non-cohesive information related to environmental management. If you ask a mayor of a city or a county official, it is fair to say that we have incredible amounts of information in our administrative system, but it is not presently comprehensive, cohesive, nor communicated so that systematic decisions may be made. Our region has begun to address this problem by utilizing innovative communication technology.

CHAPTER VII: INTERGOVERNMENTAL RELATIONS IN THE ENVIRONMENT

Environmental management has traditionally been a local responsibility. Environmental functions such as sewage, solid waste disposal, and water supply were among the earliest performed by local governments in the United States. Throughout the twentieth century, however, there has been increasing environmental activity at the state and federal levels, and the relationships between the federal, state and local levels have changed.

As [it] might be expected, the changes in the roles and responsibilities among levels of government have resulted in conflict and uncertainty. Not only is there some turmoil surrounding the roles of the three basic levels of government, but efforts to solve environmental problems have led to the development of regional approaches, e.g., regional sewer districts.

The result has been confusion and frustration for all concerned. Local governments, for example, often feel trapped between changing environmental standards, increasing enforcement actions, expanding investment in environmental facilities, and continuing uncertainty of state and federal financial assistance. Speaking at the Conference, John Quarles, Deputy Administrator of EPA, explained:

> One of the themes that has come out repeatedly is a concern that the problems have to be solved at the local level. There has been ... frequent comment by city administrators to the effect that the state officials do not understand the problems that exist at the city (or county) level, the need to deal with the problems there, and the need for flexibility to deal with them in a way that makes the most sense in light of the local circumstances. The state representatives say that the federal government does not understand the need for flexibility to deal with these problems at the local (state) level. Our regional people say that the Headquarters in Washington does not understand the need for the regions to have flexibility. Then I say ... to you ... that I guess we do not understand. (laughter).

As the most powerful actor in the intergovernmental arena, the federal government has developed a clear policy direction -- "New Federalism," to help bring order to the system. The complex web of intergovernmental relationships in the area of environmental management promises to serve as a fundamental test of that policy.

NEW FEDERALISM

The concepts behind the "New Federalism" had antecedents during the 1960's, when attempts were made to emphasize decision making at the state and local levels. As discussed today, the objectives of the New Federalism include: (1) redistribution of revenues and power from the federal government to the states and local governments; and (2) reorganization of the federal bureaucracy to make it more responsive and more regional. President Nixon stated in his 1971 State of the Union message:

> The idea that a bureaucratic elite in Washington knows best what is best for people everywhere and that you cannot trust local government is really a contention that you cannot trust people to govern themselves.

At the present time, the major elements of President Nixon's "New Federalism" include:

--general revenue sharing, a program returning $30.2 billion to state and local governments over a five year period for expenditure in nine broad areas;
--special revenue sharing, a proposal combining a number of categorical grant programs into funds for broad general purposes -- community development, education, manpower, etc.
--federal regional councils, the focusing of federal efforts and authority at the regional level to handle specific problems as close to the source as possible given to the councils representing seven federal agencies in each of the ten federal regions;
--intergovernmental cooperation, particularly the A-95 review process which allows state, regional, and local review of certain federal or federally assisted projects;
--administrative changes, including reorganization of the federal bureaucracy along program lines, decentralizing federal operations, establishing uniform regional boundaries, reducing grant processing time, and simplifying regulations.

Many of these programs are currently being implemented. Proposals for special revenue sharing and federal reorganization have not yet been approved by the Congress.

THE FEDERAL ROLE: ENVIRONMENTAL PROTECTION UNDER THE NEW FEDERALISM

Federal involvement in environmental management expanded rapidly after World War II. This involvement has generally moved through three stages. The tendency has been for Congress first to enact legislation encouraging state and local actions and establishing a federal agency for monitoring research and technical assistance. This is followed by legislation containing greater incentives to state and local governments, plus federal authority to promulgate certain standards. Finally, Congress has mandated action at the state and local level, backed by the authority of the federal government to implement programs where necessary. For example, in 1955 Congress authorized the Public Health Service to provide air pollution research and technical assistance. The Clean Air Act of 1963 contained financial incentives for state and local programs and limited federal enforcement to seek relief during interstate air emergencies. The Clean Air Act of 1970 authorized national standards to be established (and enforced if necessary) by the federal government. The same progression can be cited in the area of water pollution, beginning with the Water Pollution Control Act in 1956. The federal role was gradually strengthened by the amendments passed in 1961, 1965, and 1972. Another example of the expanded federal environmental role is the National Environmental Policy Act, passed in 1969, which requires that federal and federally-assisted projects be evaluated for their impact on the environment.

These examples seem to substantiate the position that environmental management, pollution control, in particular, is being concentrated at the federal level. This would seem to be a contradiction of the "New Federalism." In clarifying this point, EPA Deputy Administrator Quarles agreed that:

> There has been a tendency for Congress to pass laws which specify that there be stronger federal role..... [While] it is true that these problems do need to be handled at the local level, it is also true that the legislation which has passed sets a number of obligations which must be monitored or met by EPA or other federal agencies. These are responsibilities in setting standards, in specifying what the best pattern of controlled technology means for industry, in developing systems for planning programs, and in setting out the framework for a variety of activities to occur.

In response to the policy direction of the New Federalism, the Environmental Protection Agency formed regional offices conforming to the uniform regional boundaries. Regional Administrators were given a broad mandate for administering the Agency's programs in the field. The EPA Regional Administrator for Region I, based in Boston, John McGlennon, commented that:

> There is an old adage that applies here. You can declare war in Washington, but you have got to run the war in the field. This seems to me to summarize the basic domestic policy thrust of the Environmental Protection Agency and, in fact, of the Nixon Administration. It is a program of decentralizing federal bureaucratic power and on increasing state and local authority. This is the essence of the New Federalism. ... In order to administer these laws, to manage pollution control, ... EPA must recognize two facts: [1] the states will be doing much of the day-to-day work,

and [2] it is the regions that must have the authority to assist them.

Recent federal environmental legislation, notably the Clean Air Act of 1970 and the 1972 Water Pollution Control Act Amendments, has resulted in two major changes in roles and responsibilities in the federal system: (1) increased federal authority over state and local jurisdictions; and (2) increased responsibility regarding environmental matters for state and local jurisdictions. In each case state governments are given primary responsibility for implementing the legislation. States are to prepare plans for implementation of both air and water programs. This has led both state and local governments to extend their authority into areas generally bypassed before. For example, state and local governments must have authority to act in case of an air pollution alert.

On the other hand, EPA defines the program to be implemented, approves the state plans, and retains authority to intervene when not satisfied with state and local performance. A recent example of this was the issuance, on July 6, 1973, of transportation control measures by EPA to achieve air quality standards in eleven metropolitan areas (Salt Lake City, Utah; Seattle and Spokane, Washington; Chicago, Illinois; Phoenix-Tucson, Arizona; Fairbanks, Alaska; and the California urban areas of San Francisco, San Diego, Sacramento, San Joaquin Valley, and Indio). These controls were issued to supplement sections of state plans that were found to be inadequate. The measures included: automobile inspection and maintenance, automobile emission control requirements, parking limitations, and gasoline sales restrictions.

THE STATE ROLE

States were relatively inactive in the environmental area until around the turn of the century, when programs in the areas of health and conservation were widely adopted. State activities increased with federal encouragement after World War II, developing stronger programs in air and water pollution control. The recent environmental movement has had tremendous impact on state programs. Since 1970, nearly every state has passed legislation to preserve environmental quality, and several have made major organizational changes (see Chapter III). The range of these new programs include: land use planning, growth controls, wetlands protection, coastal zoning, environmental facility financing, environmental impact assessment, surcharge on non-returnable containers, restrictions on chemicals (e.g., phosphate) and pesticides, as well as increased efforts in air and water pollution control, and solid waste disposal.

In many ways, the state holds the pivotal position in terms of determining the shape of intergovernmental relations in the environmental field. In addition to defining their own environmental role, their action or inaction in response to recent federal legislation, such as air and water programs, determines whether the federal government will become directly involved in implementing various environmental programs or whether the state will retain primarily operational responsibility. Also, by virtue of the legal dependence of local governments on states, states dictate the role and functions of both regional and local governments. In an article found later in this chapter, "State Responsibility in Managing the Environment," Dan Lufkin, Commissioner, Connecticut Department of Environmental Protection, discusses the need for states to assume the initiative in developing environmental programs and to be charged with implementing major federal programs.

Recent federal legislation in the areas of air pollution control, water pollution control, and land use planning have emphasized implementation at the state level. In the area of water pollution for example, states are given the responsibility for such activities as setting standards (as long as minimum federal standards are met), administering the permit program, developing state water plans, placing priorities on construction needs within the state, and designating areawide planning and management agencies. In each of these areas, state actions must be approved by EPA. Failure on the part of the states to follow through, however, will result in federal assumption of these new programs.

States also are a major influence on the form of regional and local jurisdictions. For instance, a state may allow regional planning commissions, councils of governments, special districts for certain functions, but not multi-purpose districts. The legal framework for those jurisdictions are set by state law. This framework can include such factors as: area of jurisdiction, sources of revenue, and scope of programs. State law, therefore, defines responsibilities for environmental functions within the state. Air pollution control, for example, may be designated a health department function, administered by the state, and county, and/or local health departments. There is considerable variation among states as to the amount of autonomy regional and local governments are given. Some local governments are permitted some home rule, while in other states, local governments must seek state enabling legislation for new programs. Only a few states, for example, allow local governments to set their own environmental quality standards in addition to state standards.

THE REGIONAL ROLE

In a recent article, Francis B. Francois, a councilman in Prince George's County, Maryland, stated that:

> We no longer need to debate "Why Regionalism?," because that is no longer a valid issue. Politicians and the voting public they represent have both recognized that we must solve those problems that fail to stop at our artificial city and county boundary lines, and that it will require more than our own individual local governmental powers to bring about those solutions. The issue for the '70's and the '80's is, "How are we going to develop and

> implement the needed regional solutions, and who is going to be responsible for the process?"*

This is particularly appropriate for environmental management, where problems can be more effectively addressed on the basis of flood plain, river basin, air basin, and the like.

A variety of regional approaches have been developed, including regional planning commissions, councils of governments, special districts, metropolitan federations, consolidated city/county forms, and compacts. Regional planning commissions and councils of government have become popular approaches to regionalism. These are primarily products of federal planning legislation, recently bolstered by the A-95 review process stemming from Section 204 of the Metropolitan Development Act of 1966 and the Intergovernmental Cooperation Act of 1968. These approaches are popular among local officials because: (1) they do not alter the existing political relationships; and, (2) they are multi-purpose in nature and therefore reduce the proliferation of governmental units.

Special districts are perhaps the most prevalent type of regional organization, particularly for environmental programs, e.g., air quality control region, regional sewer district. While offering many of the advantages of regional approaches, single-purpose special districts make comprehensive approaches to regional problems exceptionally difficult. This is especially important in environmental management because complex interrelationships between environmental components, e.g., air and water, are characteristic of environmental problems. Plus, the proliferation of the agencies create a serious problem in terms of policy coordination, and public accountability.

Other regional approaches have not proven to be particularly popular. City-county consolidation, for example, has been adopted in only thirteen communities since the end of World War II. Similarly, the United States has not been as active as Canada in pursuing the Metropolitan Federation. Metropolitan Dade County (Miami) is perhaps the closest approximation in this country.

States are beginning to show strong signs of taking the initiative in developing regional approaches to problems. At least two states have moved aggressively to create state-sponsored regional councils: (1) the Twin Cities Metropolitan Council (Minnesota), which is described in "How a Regional Organization Assumes Environmental Responsibility" by Frank Lamm, Director of Environmental Planning for the Metropolitan Council of the Twin Cities Area; and, (2) the Atlanta Regional Commission (Georgia), which has also been given wide authority to coordinate the decisions and programs of local governments in the region.

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*Francis B. Francois, "Who Will Make Our Regional Decisions," Nation's Cities, November, 1972, p. 12.

Also, forty-two states have created a system of sub-state districts covering the entire state. The districts are designed to be the boundaries for federally-sponsored planning programs, councils of governments, and state service areas. In many cases the boundaries have been chosen with the needs of local government firmly in mind. In other cases state decisions have been unilateral. It should be remembered, however, that in many cases the sub-state districts are only on paper, yet to be operationalized.

Perhaps the strongest and most widespread trend in recent years has been the activity of the federal government in sponsoring areawide planning through grants-in-aid. In a study conducted by the staffs of the public interest groups representing local and state government mentioned earlier, (Federally-Sponsored Multijurisdictional Planning and Policy Development Organizations), eleven federal programs sponsoring areawide planning were identified. In a yet to be released and more comprehensive study by the ACIR, twenty-four such multijurisdictional programs were found. These programs have created hundreds of regional planning agencies and poured hundreds of thousands of dollars into the agencies. David Walker, Assistant Director, Advisory Commission on Intergovernmental Relations, reported "at last count, there were [to list a few]:

·481 law enforcement and criminal planning regions

·457 Community Action Agencies

·419 sub-state CAMPS Committees

·129 regional comprehensive health planning agencies"*

The most recent example of federal legislation that initiates a regional agency is Section 208 of the 1972 Water Pollution Control Act Amendments which requires areawide planning to coordinate all water pollution control efforts. The Act gives state governors the first option of designating the areawide planning agencies. If a governor fails to act, the chief elected officials of local governments within an area may make the designation.

THE LOCAL ROLE

Of all the levels of government, local government has the longest history of environmental management. Environmental functions such as water supply, solid waste collection and disposal, and sewage collection and disposal were among the earliest municipal functions. Provision of these services was a local government responsibility, which meant that environmental services were quite responsive to local conditions and political process. However, because of the local focus, insufficient attention was paid to the impact of environmental conditions on the surrounding area.

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*David B. Walker, "The Triumphant Technocrats and Nonfunctioning Federalism," Anthology of Selected Readings for the National Conference on Managing the Environment, p. vi-22.

Although some local governments are severely restricted legally and financially from expanding their environmental focus, many local governments have made dramatic changes during the past few years. Examples of these new local programs include: new organizational arrangements (see Chapter III); greater citizen participation; environmental planning; additional land use controls, e.g., open space zoning, marshland controls, growth controls; adoption of environmental standards, e.g., noise, or performance standards; environmental impact assessment; and, construction of improved facilities.

In many cases, local governments have found it advantageous to join through intergovernmental service agreements, with other local governments on a subregional level for environmental programs. Joseph Zimmerman, Professor of Political Science at the State University of New York at Albany, discusses in greater detail the use of intergovernmental service agreements in "The Cooperative Approach to Environmental Enhancement" found later in this chapter. Zimmerman found that three fifths of a sample of local governments utilized this mechanism. He concludes, however, that although service agreements will probably continue in popularity, their use is limited and "pressure for the upward shift of responsibility for problem solving" will increase.

The "New Federalism" has had a major impact on the role of local governments. Revenue sharing and the block grants (including special revenue sharing), place more responsibility on the local decision making process. This is less important for environmental programs, which thus far have related more to state governments. However, there is a logic to administering as many environmental programs as possible at the local level. Mark Keane, Executive Director, International City Management Association, discussed this in "Managing at the Local Level." Mr. Keane went on to emphasize the need to build the capacity of local government to respond to the increased responsibility.

ENVIRONMENTAL MANAGEMENT: INTERGOVERNMENTAL ISSUES

The intergovernmental issues of environmental management parallel most other program areas. These include: overlapping programs, conflicting (or unrealistic) standards, unreasonable enforcement measures, inadequate participation in policy making, inadequate communication, inadequate technical assistance, uncertainty and delay in program administration, and inadequate funding. The "New Federalism" attempts to resolve some of these problems. However, the Administration's decision to hold back funds for certain programs, the failure to clearly sort out the responsibilities of the various levels of government, and the absence of a consistent regional alternative have hampered these efforts. In some cases these problems have created still more conflict, e.g., the court battle over the impoundment of appropriated funds for water programs.

The future of environmental management in the federal system is open for speculation. It has already been noted that the environment conforms less to the "New Federalism" than most other program areas, in spite of the efforts of EPA. A recent study indicated that approximately eighty percent of a sample of "urban experts" (mayors, administrators, and academicians) predicted that environmental responsibilities would be centralized in the federal government by 1980.*

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*Lyle J. Sumek, "Urban Organizations of the Future," Center for Governmental Studies, Northern Illinois University, forthcoming August, 1973.

STATE RESPONSIBILITY IN MANAGING THE ENVIRONMENT

Dan W. Lufkin*

The philosophy of the new federalism that we now espouse in terms of revenue sharing and financial talk, has to extend to delegating authority and responsibility to the state level, with overview and assistance clearly coming from the regional level. Management by exception by the federal government is the rule of the day, rather than management by attention to every little detail. It is not only absolutely crazy, but impossible for the federal government to make all of our decisions for us. We have 16,000 point sources of air pollution in Connecticut alone, just for starters.

Peter Drucker, always one of the most direct and thoughtful writers about business (and we are in a business, and this is true of bureaucrats as well, myself included), says that by and large, all businessmen spend ninety percent of their time concentrating on problems, and ten percent of their time concentrating on opportunities.

Where we really have a role to play, federal, regional, or state officials, is to concentrate on our opportunities. That role must be on the state level, the responsibility for enforcement; and on the federal and the regional level (this is split a bit), the setting of the goals, the putting in place of the standards, and the establishment of the objectives, penalties and rewards. But the individual state administrators and state organizations must be left to implement the program. When the state fails to do that job, then the federal government should get in there fast, and change the deck, both in terms of dollars supplied, and in terms of authorities exercised, from Washington. Speaking for Governor Meskill, there is nothing that I know of in the State of Connecticut (other than a junior edition of Watergate) that would agitate him more than having the federal government in his backyard and all the attendant publicity about his inability to handle the job. And that's the greatest incentive for the State to do the job.

There was an article in our main newspaper in Connecticut, the Hartford Current, about Russell Miller. Our main regional airport in Connecticut is Bradley Field. The article stated the following: "Russell Miller, an amateur naturalist who makes a living as an airport businessman, maintains that Bradley Field is one of the best wildlife sanctuaries in Connecticut. He would like to see the new organization of the State Department of Environmental Protection declare the area a sanctuary. 'Wild animals quickly get used to the sounds of aircraft taking off and landing.... These sounds may in fact increase wildlife population by keeping them awake and breeding instead of sleeping.'" You can get anything you want under the tent of environment! Many of us often try it!

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*Presented by Dan W. Lufkin, Commissioner, Department of Environmental Protection, State of Connecticut, at the National Conference on Managing the Environment.

The legislature and the governor of Connecticut established the Department of Environmental Protection, and took the pieces (we really followed the lead of the federal EPA) out of health, natural resources, and agriculture. We put air, water, solid waste, pesticides, radiation, and all of the natural resource capabilities of the state for recreation, forest, fish and game, parks, boat launching, and all of those activities, together in one department, and gave the department a broad mandate. Under Act 872, which established the department, there is so much authority that we really have not found it all yet. What is not there, we pretend is there.

We have the opportunity to do the job. Within that framework, some accomplishments have come forth, and they have come forth with the support, the encouragement, and even the prod of the regional EPA in Boston under John McGlennon. There is a solid waste program that, for the first time, establishes solid waste as a state authority. We set up an independent contractor, the General Electric Company, to examine the difficult issue for one year: how to attack solid waste on a regional basis, what are the types of technology, what are the costs of those technologies, where is resource recovery in harmony with the pocketbook, and so on. What has come out of that study is the solid waste authority bill, which establishes an independent authority in the state to manage and handle solid waste. General Electric developed a plan in conjunction with our state department, that sets up 23 wastesheds, separation of combustible and noncombustible material, and the re-use of those materials, at a cost of about $10. a ton. That is economically advantageous, if all costs are figured in the high density areas of Connecticut. There is also a bonding capacity of $250 million to the authority, with one interesting aspect -- in the authority bill is the provision that, by law, there can never be more than thirty employees in that authority. There will probably never be more than fifteen. In that authority is a nine member board, and a $250 million independent bonding capability. The authority gives the incentive to the private business sector to perform efficiently on a profit making basis, creating, managing, innovating, bringing about change which is properly directed and properly incentived, and which is a role best performed by private industry.

Let government do what it is good at doing. That is establishing the policies, directing the roads to follow, and legislating into place the rewards and penalties.

One ability needed by the states is an administrative enforcement procedure, rather than a court enforcement procedure which would be used only by exception. What I am referring to is a series of administrative fines that equate the cost of compliance with the cost of non-compliance. The only thing we have now to get at a polluter in the State of Connecticut is two things: we can issue him an order, and go through all of the cumbersome and tortuous court procedures involved, or do nothing. There is nothing in between. We issued a registration activity for the 16,000 point sources of air; twenty-five percent did not respond. They probably lost it, or maybe a minority decided that they were not going to respond. The only way that we can get back that questionnaire is to take the guy to court under order. That is crazy. What we have done in the legislation, which will be passed soon, is to set an enforcement procedure, an administrative fining capability. We measure the cost of compliance, the cost of operation, the cost of equipment, opportunity costs lost, the cost of capital, on and on, and equate with that the cost of non-compliance -- legal fees, capital use saved by not being employed in that fashion, operating costs saved, fines that under the bill run, and ultimate costs discounted in terms of time of finally complying with the order. That is a big bill. So when you equate that, that is the cost of non-compliance. You equate your cost of compliance with that cost of non-compliance -- the fine. It is a continuous, running fine, which does two things. One is that people recognize the extent to which it is just as economic to comply as it is not to comply. Secondly, it eliminates all but the most meritorious suits. The frivolous suit does not go, because the clock is running while the pollution is continuing. It really does bring an additional tool which is desparately needed to the state arsenal of getting the job done at the local and at the state level.

What Washington and what the region should be spending their time doing is giving the field the tools, the incentives, the dollar bills (where the taxing capacity or the financial base of the state will not support it). They should be giving all of the opportunity to the states to do the job. When the job then is not done, step in, lock, stock, and barrel, with funds and with enforcement at a Federal or regional level. This will be management by exception which the Federal government should strive for.

HOW A REGIONAL ORGANIZATION ASSUMES ENVIRONMENTAL RESPONSIBILITY

Frank T. Lamm*

INTRODUCTION

Wise management of the environment requires commitment from the local, regional, state, and federal levels of government. The failure of any single level to do its part can negate or place in jeopardy the good work of all the rest. Since the regional organization is often the newest level of government or quasi-government, its role is often less clearly defined than that of older, more established levels. However, it can be shown that many of the important environmental management concerns can be effectively resolved at the regional level. It is, therefore, of paramount importance that regional organizations throughout the country define and assume the appropriate responsibilities that will enable them to provide effective management.

REGIONAL ORGANIZATIONS - VARIETY OF MAKEUP

There is no single description of a regional organization that is accurate for all such agencies. Some are formally structured, as by specific state legislation, while others are organized by consensus of participating local units of government. Some have an elected body, while others consist of appointed persons. Some are omni-governmental, some merely have general planning and review responsibilities, and others may have responsibility only in a single functional area of concern. Some operate under specific legislative mandate, while others are more free to function in those areas chosen by their governing body. Some can count on ample funding and staff expertise, while others are severely constrained by these factors.

The political climate within which the individual regional organizations function can also vary. In some instances the state executive role is so strong and well defined regarding regional concerns that the responsibilities of the regional organization are drastically limited, while in other instances the regional organization may be stepping into a governmental vacuum where no such well defined state responsibility exists. Also, the amount of cooperation and coordination received from local units of government and citizens at large can vary greatly.

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*Presented by Frank T. Lamm, P.E., Director of Environmental Planning Metropolitan Council of the Twin Cities Area, at the National Conference on Managing the Environment.

Within the seven-county, 3,000 square mile Metropolitan Area serving Minneapolis, Saint Paul and vicinity, the Metropolitan Council is the regional organization. Many features of the Council, such as governmental structure and legislative mandate, are not typical to regional organizations as a whole. However, many of the approaches used by the Council in planning and implementation of solutions of environmental problems can be applied to other regions.

METHODS OF ASSUMING ENVIRONMENTAL RESPONSIBILITY AT THE REGIONAL LEVEL

Regardless of the ability of the regional organization to provide solutions, there are a myriad of environmental concerns which can and should be approached at the regional level. Whether or not the regional organization has specific legislative mandate, there are many opportunities for cooperation with the appropriate state natural resource or environmental protection organization, or local implementing organization in order to address these concerns. This is especially true in the case of a regional planning and review organization, such as a council of governments or a metropolitan council, where limited operational or monitoring responsibility may preclude direct access to appropriate legal and other implementing devices, as well as to specific federal or state funding sources. Such cooperation can result in effective planning and implementation, assuring maximum consideration of regional concerns.

Important indications of environmental responsibility at the regional level include the designation of the organization by HUD as the area-wide planning organization with appropriate certifications, and designation of the organization as regional clearinghouse under Bureau of the Budget Circular A-95.

The Twin Cities Area Metropolitan Council has environmental responsibility in the separate areas of air quality, solid waste management, water pollution control, water resources, and protection and recreation open space. This paper briefly discusses some methods of assuming regional responsibility in each of these environmental areas. In some instances, the Council has acted in conformance with clearly defined federal or state legislation, while in other instances it has been necessary to establish roles of cooperation with other governmental agencies that have the specific legislative responsibility.

Air quality has important regional implications, especially in regard to area-wide comprehensive planning, since air quality standards and other regulations, combined with the state-wide air quality implementation plan, may have a significant effect on the location of such facilities as major airports, highways, and industrial or commercial complexes. Air quality responsibility rests primarily with the state. In Minnesota, state legislation assigns that responsibility to the

Minnesota Pollution Control Agency, which may delegate many powers to regional implementation organizations. Through administrative agreement, regional air quality planning and referrals concerning approval of permits for certain large facilities must be approved by the Metropolitan Council prior to action by the State PCA.

It is difficult for general planning organizations to receive funding for air quality planning from the Environmental Protection Agency. However, there are funds from other federal agencies, such as the Federal Highway Administration, Urban Mass Transit Administration, and Federal Aviation Administration, which may be available to appropriate regional agencies. The Twin Cities Metropolitan Council uses funds from these agencies and also cooperates with the Minnesota Pollution Control Agency in developing the metropolitan area's portion of the state-wide implementation plan for air quality.

Solid waste management is another environmental concern where cooperation with state, regional, and local agencies can occur effectively. In 1969 the Minnesota legislature created the Solid Waste Management Act. Recommendation for such legislation came from private citizen groups, municipalities, counties, and state interests, and was based on Metropolitan Council studies, hearings, and advisory board deliberations. The act assigned certain planning and permit review responsibilities within the metropolitan area to the Minnesota Pollution Control Agency, the Metropolitan Council, and the metropolitan area counties. The Pollution Control Agency grants a state permit, subject to Council review, and monitors the sites. The Council develops a regional solid waste management plan, approves county plans if they conform to the Council plan, and reviews permit applications. The counties develop county plans and ordinances, issue local permits, and also inspect sites. This distribution of planning and review functions has operated very effectively over the past four years. In this area of concern, it is very difficult for a planning and review agency to directly receive EPA planning funds. However, it is possible to act as a subcontractor to the appropriate federal or regional operational agency. Metropolitan Council has received flow-through funding from MPCA for solid waste studies. Also, HUD does have authority to grant planning monies for solid waste management, although this is not one of the more widely used funding sources.

Water Pollution control has become the most widely publicized environmental concern. The idea of a regional agency planning the solution to the Twin Cities Metropolitan Area water pollution control problems was one of the reasons for creation of the Metropolitan Council in 1967. The Council immediately began a technical study of the existing sewerage system and present and future needs, which resulted in a recommendation to the 1969 legislature to create a single operating agency to be responsible to the Council for provision of adequate metropolitan sewage collection and disposal facilities. The Council, after a lengthy public hearing process, adopted a development guide section for water pollution control in the Metropolitan Area. That guide section, modified annually since 1970 by capital improvements programs, forms the basis of construction and operation of the metropolitan disposal system. The Minnesota Pollution Control Agency has agreed annually to accept the Council's capital improvements program and project priority list as the Metropolitan Area's portion of the state request for EPA construction funding. The Council has received a three year basin planning grant from EPA. With the grant, the Council has produced the interim Water Quality Management Plan for the Metropolitan Area and is preparing the "official" Water Quality Management Plan. Also, the Council is recognized as the area-wide planning organization by HUD.

Metropolitan Council water pollution control responsibility extends far beyond the planning and capital improvements programming processes. The Council also approves the annual operating budget of the Metropolitan Sewer Board and the allocation of metropolitan disposal system costs to municipalities. The Council provides A-95 review for federal funding purposes and, in addition, review of required local comprehensive sewer plans for conformance to the Council's development guide. This latter review takes place in cooperation with the review provided by the Metropolitan Sewer Board, which under the Metropolitan Sewer Act was given that responsibility.

The Council received substantial planning funding for water pollution control studies from HUD during the initial study years. From 1970 to early 1973 the Council had a three year basin planning grant awarded by EPA. It is true that the 1972 amendments to the Federal Water Pollution Control Act has caused EPA planning sources to be temporarily closed, but the Council does anticipate planning funds to be made available under the new amendments, under at least one of three sections of the act: 201, wherein through cooperation with the implementing agency (the Metropolitan Sewer Board) planning funds could be made available as a part of the construction grant; 208, where the Council would meet the test of an area-wide planning agency; or 303(e), through cooperation with the Minnesota Pollution Control Agency as part of the state-wide continuing planning process.

In the water resources area, efforts by the regional organization can result in a broadened respect for that organization throughout the regional area. Problems such as erosion, sedimentation, and flooding are prevalent in many parts of the nation. Coordination of water supply needs is also important, whether there is one single, limited source, or where there is a choice of a number of surface and groundwater sources. Adequacy of treatment, storage, and fire protection, variations in water rates, and provision of water supply on a multi-municipal basis are all subjects which may be considered. It is necessary to provide an area-wide plan for water supply and storm drainage in order to receive HUD certification.

The legislation creating the Council gave it planning responsibility in the area of water resources within the Twin Cities Metropolitan Area. Subsequent amendment of the state Watershed Act required watershed districts in the Metropolitan Area to submit their Overall Plans and Comprehensive Plans to the Council for review and approval.

The Council staff works closely with local, state, and federal water resource organizations. The U.S. Geological Survey provides data under cooperative agreements, including a three and one-half year study of water sources available to the area. Staff represent the Council and the Metropolitan Area on the State Water Resources Coordinating Committee and on the advisory board to the State Water Resource Research Center. Staff also represents the state on the Upper Mississippi River Basin Commission Level "B" study for the Metropolitan Area. The Council has participated in water resources studies of portions of the Metropolitan Area in cooperation with the State Department of Natural Resources and has jointly sponsored a seminar on watershed districts in cooperation with the Minnesota Association of Watershed Districts. Planning for most of the water resources effort has been supplemented by HUD funding throughout the life of the Council.

Protection and recreation open space are two natural resource considerations that are of great concern to the Council. There does not seem to be a well-coordinated effort in the area of open space protection assuring that our important or unique land resources will be properly managed and where necessary preserved or protected. Of particular importance are areas under immediate pressure for urban development. Regional organizations can provide a much-needed focal point to examine such issues. This is not easy to do, for many reasons. First, it is difficult and costly to document the importance and uniqueness of many land forms. Secondly, it is difficult and expensive to determine what proper protection or management steps are to be taken. Thirdly, it is difficult to persuade local units of government to consider protection elements in their zoning and land use ordinances.

The Council has adopted and revised its Open Space Development Guide. That guide has attempted, through policies, general system plan, and procedures to persuade local units of government to consider protection and management proposals. The difficult job of documenting those protection measures is now being initiated. The Council has been assigned a soil conservationist from the Soil Conservation Service under the Intergovernmental Cooperation Act to assist staff in developing the technical data.

In recreation open space the Council has concentrated on recommending the regional portions of a recreation system, along with appropriate policies. Council staff has cooperated with various public and private groups in the open space arena. Of particular note was the creation of an Open Space Advisory Board which developed the latest guide section and recommended legislation which is presently being considered by the Minnesota Legislature.

SUMMARY

I have attempted to outline some of the methods by which regional organizations can assume environmental responsibility, using the Twin Cities Area Metropolitan Council as an example. Major methods of assuming responsibility or participating in the approval process can be summarized as follows:

(1) Refer to the mandate of legislation which created the regional organization. Where the organization was not formed by legislation, incorporate such responsibility in the charter of the organization or other document creating it. Legislate changes to the mandate when necessary.

(2) Receive designation as regional clearinghouse for A-95 review and for HUD certification purposes as the area-wide planning agency.

(3) Cooperate and coordinate with those organizations at other levels of government which have specific environmental responsibilities resulting from federal or state legislation. Where necessary, enter into contractual agreements or memos of understanding to provide the coordination.

(4) Cooperate with and be responsive to queries from the public at large. Often the effectiveness of the regional role in environmental management is directly related to the credibility of the regional organization in the eyes of the private citizen. Disseminate information to the widest extent feasible.

(5) Provide adequate staff and a continuous program of study, along with appropriate products, to assure contribution to the environmental concerns commensurate with your responsibilities. Make full use of federal, state, and other sources of funding.

(6) Be innovative in your thinking, and remember to address the governmental structure and fiscal measures best suited to provide the changes recommended.

THE COOPERATIVE APPROACH TO ENVIRONMENTAL ENHANCEMENT

Joseph F. Zimmerman *+

Interlocal service agreements have been utilized for many years, with federal encouragement, to solve areawide environmental problems. The emphasis the federal government places upon such agreements is reflected in the Federal Water Pollution Control Act Amendments of 1972 which direct the Governor of each State to identify areas suffering from water quality control problems and designate "a single representative organization, including elected officials from local governments or their designees, capable of developing effective areawide waste treatment management plans for [each area]."‡

The number of service agreements has increased sharply during the past twenty-five years following the removal of many constitutional and statutory restrictions inhibiting the ability of local governments to enter into such agreements. Currently, forty-two states have enacted a general interlocal contracting act. In twenty nine states local governments are authorized to cooperate with local governments in other states, and Michigan authorizes its local governments to cooperate with Canadian local governments. (see Table 1).

One of the broadest grants of power to local governments to cooperate with other governmental units is found in the New York State Constitution.

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*Presented by Joseph F. Zimmerman, Professor, State University of New York, Albany, at the National Conference on Managing the Environment.

+This paper is based on data collected for a larger study of substate regionalism being conducted by the Advisory Commission on Intergovernmental Relations under the direction of Dr. Carl W. Stenberg. See Joseph F. Zimmerman, "Intergovernmental Service Agreements" in Substate Regionalism (Washington, D.C.: Advisory Commission on Intergovernmental Relations, forthcoming), chap. III.

‡Federal Water Pollution Control Act Amendments of 1972, 70 STAT. 498, 33 U.S.C. 1151.

TABLE 1

	Code Refer.	Cooper. Power	Contract Power	Across St. Lines	Local unit w/home St.	Local Unit with U.S.	Power of Only one Unit Nec.	Requires Action of Governing Bodies	Appvl of Atty. G.	Other Statutes Unaffted	Revocation or Term.	Responsibility Clause
United States												
Alabama												
Alaska	C.X.Sec.13	X			X	X	X					
Arizona	Sec.11-951	X	X	X	X	X		X	X	X	X	X
Arkansas	Sec.14-901	X	X	X	X	X		X	X		X	X
California	Gov.6500	X	X2	X	X	X		X	X		X4	
Colorado	88-2-1	X	X	X	X	X		X		X		X
Connecticut	Sec.7-339a	X	X	X	X			X	X	X		X
Delaware												
Dist. of Col.												
Florida	Sec.163.01	X	X	X	X	X			X	X	X4	X
Georgia	Sec.2-5901	X			X			X				
Hawaii												
Idaho	67-2319	X	X	X	X	X		X	X		X	
Illinois	24Sec.1-1-5	X	X	X	X	X						
Indiana	Sec.53-1104	X	X	X	X	X		X	X			X
Iowa	Sec.28E.1	X	X	X	X	X	X3	X		X	X	X
Kansas	12-2901	X		X	X	X	X	X	X		X	X
Kentucky	65.210	X	X	X	X	X		X	X		X	X
Louisiana	33Sec.1321	X						X				
Maine	30Sec.1951	X			X	X	X	X	X		X	X
Maryland												
Massachusetts	Ch.40Sec.4a	X	X					X			X	
Michigan	5.4088	X	X	X	X	X				X	X4	
Minnesota	Sec.471.59	X	X	X	X	X		X		X	X	
Mississippi												
Missouri	Sec.70.210	X	X	X	X			X			X4	
Montana	16-4904	X	X		X		X	X	X		X	
Nebraska	Sec.23-2201	X	X	X	X	X		X			X	X
Nevada	277.080	X	X	X	X	X	X3	X	X		X	X
New Hampshire												
New Jersey	40.48B-1	X						X		X	X	
New Mexico	4-22-1	X		X	X	X		X			X4	
New York		X		X								
North Carolina	Sec.180A-460	X	X	X			X	X				
North Dakota	54-40-01	X		X	X	X	X	X		X	X4	
Ohio												
Oklahoma	74Sec.1001	X	X	X	X	X	X	X	X		X	X
Oregon	Sec.190.003	X	X	X	X	X					X	
Pennsylvania	53Sec.471	X	X					X				
Rhode Island												
South Carolina	Sec. 1-75	X						X				
South Dakota	1-24-1	X	X	X	X	X		X				X
Tennessee	12-801	X	X	X	X	X		X	X	X	X	X
Texas	Art.4413(32c)	X	X		X				X			
Utah	Sec.11-13-1	X	X	X	X	X		X	X		X	X
Vermont	24Sec.34901	X	X					X	X			
Virginia	Sec.15.1-21	X						X			X	X
Washington	39.34.010	X	X	X	X	X		X		X	X	X
West Virginia	Sec.8-23-3	X	X					X	X	X	X	X
Wisconsin	66.30	X	X	X	X				X			
Wyoming	Ch.239S.L.1971	X		X	X	X	X	X			X4	
Puerto Rico												

[1] The functions are limited--seems to include everything but general government.

[2] Cities and counties only.

[3] Only for contracting

[4] May be provided for, but is not mandated.

[5] May be perpetual

[6] One year renewable--if more, it must be approved by concurrent voter majorities.

[7] Binding for the specified time.

[8] Requires concurrent voter majorities.

[9] Requires approval of governor when State money is used. When State, U.S., another State or subdivision, Canada or subdivision are a party to the agreement.

SOURCE: Advisory Commission on Intergovernmental Relations

> Local governments shall have the power to agree, as authorized by act of the Legislature, with the federal government, a state or one or more other governments within or without the state, to provide cooperatively, jointly, or by contract any facilities, service, activity, or undertaking which each participating local government has the power to provide separately.[*]

Most states have granted blanket authorization to their local units to provide services to other units or jointly provide services, yet a number of states still have specific statutory provisions authorizing such agreements. Minnesota, for example, has approximately 110.[+]

Two provisions in many general interlocal cooperation acts impede the ability of local governments to enter into service agreements. A power may not be exercised in thirty-two states unless each local government possesses the power. This means that a city and a town can not jointly provide a service if only the city possesses the authority to provide the service. The general interlocal cooperation statute in thirteen states further restricts the ability of local governments to enter into agreements by stipulating that an individual statute authorizing cooperation in a specific functional area is not superceded by the general statute. There are approximately two hundred specific statutes in New Jersey.[‡]

The State of Rhode Island and Providence Plantations lack a joint exercise of powers act, but do have a general law specifically authorizing cities and towns to establish regional councils of governments. The law contains an unusual provision: A "council may, by appropriate action of the governing bodies of the member governments, exercise such other powers as are exercised or capable of exercise by the member governments and necessary or desirable for dealing with problems of mutual concern."[**]

One of the major reasons accounting for the popularity of intergovernmental service agreements is their high degree of political feasibility.

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[*] Constitution of the State of New York.art. IX, sec. 1 (c).

[+] Leigh E. Grosenick, A Manual for Interlocal Cooperation in Minnesota (St. Paul: Office of Local and Urban Affairs, State Planning Agency, May 1969), p. 113.

[‡] Joint Services--A Local Response to Areawide Problems (Trenton: County and Municipal Government Study Commission), p. 38.

[**] Rhode Island General Laws Annotated, §§ 54-43-3.

They usually encounter little opposition since they do not restrict significantly the freedom of action of the recipient governments, do not require voter approval in most cases, and usually can be terminated on relatively short notice. Consequently, local officials view service agreements as a flexible method of obtaining services as needed.

Three other reasons also account for the popularity of service agreements. First, a local government by means of an agreement, may be able to obtain a product or a service, such as water or sewage disposal, which the locality can not produce itself. Second, obtaining a service from another governmental unit may lower the cost and improve the quality of the service. The provider of the product or service also may benefit from a service agreement if it results in economies of scale. Third, interlocal agreements may facilitate the solution of a problem transcending local political boundaries without necessitating a major structural change in the local government system.

A local government, of course, may not have the option of producing a service or obtaining a service from another producer for one or more of the following reasons. First, a city or a public authority may have monopolistic control of a basic resource such as water, and all local governments must obtain water from this one supplier. Second, the cost of directly providing a service may be prohibitive. Third, the isolated location of a unit may preclude the possibility of obtaining a service from another unit. Fourth, the only neighboring local government with the ability to provide a given service may refuse to do so.

Service agreements, with a few exceptions, are entered into voluntarily by local governments. A state government on rare occasions has ordered one local government to provide a product or a service to a neighboring unit. And in a few states, Texas is an example, counties are required by statute to provide certain specified services upon receipt of a request from a city.

Data for this paper on the scope and nature of agreements for seventy-six services were obtained by means of a twenty page questionnaire sent to 5,900 incorporated municipalities--cities, villages, boroughs, incorporated towns--over 2,500 population. Returns were received from forty percent of these units, and were classified by population categories, geographic region, form of government, and central city, suburban and non-metropolitan types.

The collection of data on service agreements by means of a mail questionnaire, particularly a long one, results in an under-reporting of the number of agreements for two principal reasons.*

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*For a fuller description of the problems encountered in gathering data on service agreements, see H. Paul Friesema, Metropolitan Political Structure: Intergovernmental Relations and Political Integration in the Quad Cities (Iowa City: University of Iowa Press, 1971), pp. 37-42.

First, accurate records of service agreements, especially unwritten ones, are not maintained by most local governments. Second, several respondents indicated they did not have time to complete the questionnaire and returned it blank. It is reasonable to assume that some of these municipalities, as well as some which did not return the questionnaire, are parties to service agreements.

SERVICES RECEIVED

Table 2 reveals that sixty-three percent of the 2,375 responding municipalities have entered into formal and informal agreements for the provision of services to their citizens by other governmental units or private firms. The propensity to enter into agreements generally is related to population size. Units in the 50,000 to 100,000 population class, however, enter into agreements with a slightly greater degree of frequency than larger units, and units in the 25,000 to 50,000 class enter into agreements more often than units in the 100,000 to 250,000 class.

The presence of a larger number of acute problems and service suppliers in metropolitan areas accounts for the finding that central cities (seventy-five percent) and suburban governments (seventy-one percent) enter into service agreements with more frequency than municipalities in non-metropolitan areas (fifty-three percent).

Classifying service agreements by region, we find that they are most common in the West (seventy-nine percent) and least common in the South (fifty-four percent). Although agreements with a local government in a neighboring state were reported by only fourteen respondents, we know that such agreements are more common. To cite only two examples, sixteen Rhode Island cities and towns have joined with Attleboro and Seekonk, Massachusetts in a police communication network, and cities and towns in New Hampshire, Massachusetts, and Vermont are members of the Southwestern New Hampshire District Fire Mutual Aid System.*

Of the various forms of municipal administration, council-manager governments enter into service agreements with the greatest degree of frequency (sixty-nine percent). Vincent L. Marando reported a similar finding in the Detroit area in 1968.+

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*Joseph F. Zimmerman, "Solving Areawide Problems in Rhode Island," Newsletter (Kingston: Bureau of Government Research, University of Rhode Island, September 1972), p. 2. and "Can Cities and Towns Meet the Challenges of the Space Age?" New Hampshire City and Town, June 1972, pp. 104-10.

+Vincent L. Marando, "Inter-Local Cooperation in a Metropolitan Area: Detroit," Urban Affairs Quarterly, December 1968, p. 193.

TABLE 2

MUNICIPALITIES WITH AGREEMENTS
FOR RECEIPT OF SERVICES

	NUMBER OF REPORTING CITIES	HAVE AGREEMENT FOR SERVICES		WITH MUNICI-PALITIES		WITH COUNTIES		WITH SCHOOL DISTRICTS		WITH OTHER SPECIAL DISTRICTS		WITH PUBLIC AUTHOR-ITIES		WITH STATE		WITH OTHER	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
TOTAL, ALL CITIES	2375	1491	63	600	40	919	62	380	25	412	28	249	17	429	29	217	15
POPULATION GROUP																	
OVER 500,000	10	8	80	1	13	3	38	1	13	2	25	0	0	1	13	3	38
250,000-500,000	10	8	80	3	38	7	88	6	75	7	88	5	63	7	88	6	75
100,000-250,000	50	36	72	18	50	27	75	15	42	18	50	14	39	22	61	12	33
50,000-100,000	110	89	81	42	47	67	73	36	41	35	39	31	35	39	44	21	24
25,000- 50,000	236	180	76	81	45	118	66	60	33	60	33	46	46	64	36	31	17
10,000- 25,000	532	357	67	156	44	225	63	114	32	106	30	51	14	93	26	41	11
5,000- 10,000	618	360	58	141	39	217	60	77	21	86	24	52	14	98	27	41	11
2,500- 5,000	812	446	55	154	35	251	56	69	15	96	22	49	11	104	23	62	14
GEOGRAPHIC REGION																	
Northeast	502	275	55	149	54	83	30	72	26	55	20	67	24	79	29	37	13
North Central	791	513	65	224	44	317	62	126	25	142	28	58	11	122	24	73	14
South	706	380	54	118	31	253	67	66	17	81	21	81	21	123	32	66	17
West	398	313	79	109	35	266	86	116	37	134	43	43	14	105	34	41	13
FORM OF GOVERNMENT																	
Mayor-Council	1148	645	56	257	40	357	55	136	21	152	24	91	14	167	26	88	14
Council-Manager	1098	762	69	315	41	519	68	249	33	238	31	157	21	233	31	118	15
Commission	78	46	59	11	24	34	74	8	17	9	20	5	11	16	35	4	9
Town Meeting	57	30	53	12	40	6	20	15	50	9	30	6	20	11	37	4	13
Representative Town Meeting	14	8	59	5	63	3	38	2	25	2	25	1	13	2	25	2	25
LOCATION																	
Central City	155	117	75	43	37	81	69	41	35	46	39	37	32	53	45	39	33
Suburban Unit	1076	762	71	426	56	458	60	201	26	241	29	142	19	201	26	112	13
Non-Metropolitan Unit	1164	612	53	131	21	380	62	128	21	127	21	70	11	176	29	76	12

The finding of the national and Marando surveys is not surprising as a professional administrator is more likely than an elected chief executive to seek to lower the cost of a service or a product by obtaining it from other governmental units or private firms.

Municipalities most commonly enter into service agreements with counties and other municipalities. Nevertheless, the state government, public authorities, and private firms are major suppliers of services to local governments. Police training, criminal identification, police patrol, fireman training, traffic control, and water pollution abatement services are the principal services provided by state governments. Private firms are major providers of the following services--refuse collection, engineering, legal, street lighting, public relations, and microfilm.

The most popular agreements involve jails and detention homes, police training, street lighting, refuse collection, solid waste disposal, and animal control services.

Data relative to sewage disposal agreements are contained in Table 3. The bulk of the agreements, fifty-three percent, are with other local governments. Special districts also are parties to a significant number (eighty-seven) of agreements. Agreements with other local governments are most common in the South (sixty-nine percent) and least common in the Northeast (thirty-six percent), and council-manager and mayor-council units have about the same proclivity for entering into agreements. As one would anticipate, it is the smaller and medium size units which are parties to the agreements for the disposal of sewage with a greater degree of frequency than central cities which are more likely to have their own disposal facilities.

Table 4 reveals that solid waste disposal is most often provided under a service agreement by other local governments (forty-eight percent) and private firms (forty-two percent). The tendency of a local government to enter into an agreement with another local government for the disposal of solid waste is positively correlated with increasing population size with the exception of the 5,000 to 10,000 population category. The breakdown of agreements by geographic region is revealing. Whereas sixty percent of the responding incorporated municipalities in the North Central Region have entered into agreements with private firms, only thirty-one percent have entered into agreements with other local governments. By comparison, seventy-three percent of the responding municipalities in the South have entered into agreements with other local governments, but only sixteen percent have entered into agreements with private firms. Relative to form of government, fifty-one percent of the council manager units and forty-three percent of the mayor-council units have entered into agreements with other local governments for the disposal of solid waste.

The major suppliers of water, according to Table 5, are other local governments (forty-five percent), private firms (twenty-five percent), and special districts (twenty-one percent). In general, water supply

TABLE 3

SEWAGE DISPOSAL AGREEMENTS

	NUMBER OF UNITS REPORTING	WITH LOCAL GOVERNMENTS		WITH SCHOOL DISTRICTS		WITH OTHER SPECIAL DISTRICTS		WITH COG OR OTHER REGIONAL UNITS		WITH STATE GOVERNMENT.		WITH FEDERAL GOVERNMENT		WITH PRIVATE FIRMS	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%
TOTAL, ALL MUNICIPALITIES	307	165	53	1	0	87	28	23	7	5	1	5	1	18	5
POPULATION GROUP															
OVER 500,000	3	0	0	0	0	2	66	0	0	0	0	0	0	1	33
250,000-500,000	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100,000-250,000	10	5	50	0	0	4	40	1	10	0	0	0	0	0	0
50,000-100,000	26	13	50	0	0	9	34	1	3	0	0	0	0	2	7
25,000- 50,000	48	28	58	1	2	12	25	5	10	0	0	1	2	1	2
10,000- 25,000	81	41	50	0	0	29	35	5	6	1	1	2	2	3	3
5,000- 10,000	67	41	61	0	0	15	22	6	8	2	2	0	0	3	4
2,500- 5,000	71	37	52	0	0	16	22	5	7	2	2	2	2	8	11
GEOGRAPHIC REGION															
Northeast	68	25	36	0	0	26	38	8	11	2	2	0	0	7	10
North Central	95	54	56	1	1	25	26	6	6	2	2	1	1	5	5
South	65	45	69	0	0	11	16	3	4	1	1	2	3	3	4
West	79	41	51	0	0	25	31	6	7	0	0	2	2	3	3
FORM OF GOVERNMENT															
Mayor-Council	115	61	53	1	0	26	22	11	9	1	0	4	3	10	8
Council-Manager	181	102	56	0	0	58	32	11	6	2	1	1	0	6	3
Commission	3	0	0	0	0	1	33	1	33	0	0	0	0	0	0
Town Meeting	7	1	14	0	0	2	28	0	0	2	28	0	0	2	28
Representative Town Meeting	1	1	100	0	0	0	0	0	0	0	0	0	0	0	0
LOCATION															
Central City	20	7	35	0	0	8	40	1	5	0	0	0	0	2	10
Suburban Unit	247	139	56	1	0	70	28	21	8	2	0	3	1	10	4
Non-Metropolitan Unit	40	19	47	0	0	9	22	1	2	3	7	2	5	6	15

TABLE 4

	NUMBER OF UNITS REPORTING	SOLID WASTE DISPOSAL AGREEMENTS WITH LOCAL GOVERNMENTS		WITH SCHOOL DISTRICTS		WITH OTHER SPECIAL DISTRICTS		WITH COG OR OTHER REGIONAL UNITS		WITH STATE GOVERN-MENTS		WITH FEDERAL GOVERN-MENT		WITH PRIVATE FIRMS	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%
TOTAL, ALL MUNICIPALITIES	301	146	48	0	0	14	4	8	2	4	1	0	0	128	42
POPULATION GROUP															
OVER 500,000	2	0	0	0	0	0	0	0	0	0	0	0	0	2	100
250,000-500,000	1	1	100	0	0	0	0	0	0	0	0	0	0	0	0
100,000-250,000	9	5	55	0	0	1	11	0	0	0	0	0	0	3	33
50,000-100,000	20	11	55	0	0	0	0	0	0	0	0	0	0	9	45
25,000-50,000	42	20	47	0	0	4	9	1	2	1	2	0	0	16	38
10,000- 25,000	71	33	46	0	0	5	7	1	1	0	0	0	0	32	45
5,000- 10,000	64	36	56	0	0	1	1	2	3	2	3	0	0	23	35
2,500-- 5,000	92	40	43	0	0	3	3	4	4	1	1	0	0	43	48
GEOGRAPHIC REGION															
Northeast	48	22	45	0	0	2	4	0	0	1	2	0	0	23	47
North Central	108	34	31	0	0	4	3	4	3	0	0	0	0	65	60
South	79	58	73	0	0	3	3	2	2	3	3	0	0	13	16
West	66	32	48	0	0	5	7	2	3	0	0	0	0	27	40
FORM OF GOVERNMENT															
Mayor-Council	126	55	43	0	0	5	3	6	4	3	2	0	0	56	44
Council-Manager	170	88	51	0	0	8	4	2	1	1	0	0	0	71	41
Commission	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Town Meeting	5	3	60	0	0	1	20	0	0	0	0	0	0	1	20
Representative Town Meeting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LOCATION															
Central City	29	15	51	0	0	1	3	0	0	0	0	0	0	13	44
Suburban Unit	175	73	41	0	0	13	.7	6	3	1	0	0	0	81	46
Non-Metropolitan Unit	97	58	59	0	0	0	0	2	2	3	3	0	0	34	35

TABLE 5

WATER SUPPLY AGREEMENTS

	NUMBER OF UNITS REPORTING	WITH LOCAL GOVERNMENTS.		WITH SCHOOL DISTRICTS		WITH OTHER SPECIAL DISTRICTS		WITH COG OR OTHER REGIONAL UNITS		WITH STATE GOVERNMENT		WITH FEDERAL GOVERNMENT		WITH PRIVATE FIRMS	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%
TOTAL, ALL MUNICIPALITIES	297	135	45	1	0	65	21	7	2	7	2	5	1	77	25
POPULATION GROUP															
OVER 500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
250,000-500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100,000-250,000	11	3	27	0	0	5	45	0	0	0	0	1	9	2	18
50,000-100,000	26	9	34	0	0	9	34	1	3	1	3	1	3	5	19
25,000- 50,000	38	16	42	1	2	10	26	1	2	0	0	2	5	8	21
10,000- 25,000	76	38	50	0	0	13	17	0	0	0	0	0	0	25	32
5,000- 10,000	71	32	45	0	0	14	19	4	5	2	2	1	1	18	25
2,500- 5,000	75	37	49	0	0	14	18	1	1	4	5	0	0	19	25
GEOGRAPHIC LOCATION															
Northeast	64	20	31	0	0	13	20	3	4	0	0	0	0	28	43
North Central	98	66	67	1	1	8	8	0	0	2	2	1	1	20	20
South	76	37	48	0	0	22	28	1	1	2	2	3	3	11	14
West	59	12	20	0	0	22	37	3	5	3	5	1	1	18	30
FORM OF GOVERNMENT															
Mayor-Council	129	63	48	1	0	19	14	3	2	5	3	1	0	37	28
Council-Manager	156	67	42	0	0	44	28	4	2	2	1	4	2	35	22
Commission	6	3	50	0	0	1	16	0	0	0	0	0	0	2	33
Town Meeting	4	1	25	0	0	1	25	0	0	0	0	0	0	2	50
Representative Town Meeting	2	1	50	0	0	0	0	0	0	0	0	0	0	1	50
LOCATION															
Central City	19	8	42	0	0	7	36	1	5	0	0	0	0	3	15
Suburban Unit	218	110	50	1	0	45	20	5	2	4	1	4	1	49	22
Non-Metropolitan Unit	60	17	28	0	0	13	21	1	1	3	5	1	1	25	41

agreements are inversely correlated with population size; the exception being the 10,000 to 25,000 population class. Special districts (thirty-seven percent) are the major suppliers of water in the West and other local governments (sixty-seven percent) are the major suppliers in the North Central Region. Not surprisingly, incorporated municipalities in non-metropolitan areas receive water more often from private firms than from other local governments since there are few municipalities in such areas with the capacity of supplying water to other units.

Water distribution agreements present a somewhat different pattern than water supply agreements (see Table 6) in that incorporated municipalities have a greater tendency to enter into distribution agreements with private firms (thirty-eight percent) than with other local governments (thirty-five percent), and mayor-council units (thirty-two percent) have a lesser tendency than council-manager units (forty-one percent) to enter into agreements with private firms. The geographical pattern of the two types of agreements is generally similar, but suburban units are more dependent upon agreements for the supply of water than for the distribution of water.

PACKAGE OF SERVICES

Relatively few agreements involve a package of services (see Table 7). The bulk of the agreements involve only one service and only two governments--the provider and the recipient of the services. Most binary agreements relate to functions which tend to be non-controversial --civil defense, fire and police mutual aid, jails, and water supply. We must point out, however, that many municipalities have entered into several individual service agreements.

There is a two-fold explanation for the small number of package agreements. First, few local governments have the ability and the desire to provide a package of services. Second, most recipients of services are interested only in a service which they can not provide economically themselves or a product which they can not produce themselves.

Not surprisingly, local governments in non-metropolitan areas are the recipients of the fewest packages of services. In these areas there often is no local government with the capacity to provide a package of services to other units.

The number of package agreements declines with a decrease in population with one exception--the 2,500 to 5,000 population class. Package agreements are most common in the West which is the home of the Lakewood Plan.

Many municipalities had received more than one service from another local government on a contract basis prior to 1954, yet the concept of a contract providing for a large number of services did not originate until 1954 when the newly incorporated City of Lakewood signed a formal agreement with Los Angeles County to have it provide

TABLE 6

WATER DISTRIBUTION AGREEMENTS

	NUMBER OF UNITS REPORTING	WITH LOCAL GOVERN-MENTS		WITH SCHOOL DISTRICTS		WITH OTHER SPECIAL DISTRICTS		WITH COG OR OTHER REGIONAL UNITS		WITH STATE GOVERN-MENT		WITH FEDERAL GOVERN-MENT		WITH PRIVATE FIRMS	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%
TOTAL, ALL MUNICIPALITIES	163	58	35	1	0	33	20	5	3	1	0	3	1	62	38
POPULATION GROUP															
OVER 500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
250,000-500,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100,000-250,000	6	3	50	0	0	2	33	0	0	0	0	0	0	1	16
50,000-100,000	10	2	20	0	0	3	30	0	0	0	0	0	0	5	50
25,000- 50,000	18	5	27	1	5	5	27	0	0	0	0	1	5	6	33
10,000- 25,000	36	12	33	0	0	4	11	0	0	0	0	0	0	20	55
5,000- 10,000	42	16	38	0	0	7	16	2	4	0	0	1	2	16	38
2,500- 5,000	51	20	39	0	0	12	23	3	5	1	1	1	1	14	27
GEOGRAPHIC REGION															
Northeast	38	8	21	0	0	8	21	1	2	0	0	0	0	21	55
North Central	50	26	52	1	2	4	8	0	0	0	0	1	2	13	36
South	39	20	51	0	0	10	25	2	5	0	0	2	5	5	12
West	36	4	11	0	0	11	30	2	5	1	2	0	0	18	50
FORM OF GOVERNMENT															
Mayor-Council	78	32	41	1	1	13	16	4	5	1	1	2	2	25	32
Council-Manager	77	25	32	0	0	19	24	1	1	0	0	0	0	32	41
Commission	2	0	0	0	0	0	0	0	0	0	0	1	50	1	50
Town Meeting	4	0	0	0	0	1	25	0	0	0	0	0	0	3	75
Representative Town Meeting	2	1	50	0	0	0	0	0	0	0	0	0	0	1	50
LOCATION															
Central City	11	5	45	0	0	3	27	0	0	0	0	0	0	3	27
Suburban Unit	112	40	35	1	0	25	22	2	1	1	0	2	1	41	36
Non-Metropolitan Unit	40	13	32	0	0	5	12	3	7	0	0	1	2	18	45

TABLE 7

MUNICIPALITIES RECEIVING AND PROVIDING A PACKAGE OF SERVICES

	NUMBER OF MUNICIPALITIES REPORTING	RECEIVE PACKAGE OF SERVICES		NUMBER OF MUNICIPALITIES REPORTING	PROVIDE PACKAGE OF SERVICES TO OTHER UNITS	
		#	%		#	%
TOTAL, ALL MUNICIPALITIES	1394	188	13	2135	239	11
POPULATION GROUP						
OVER 500,000	4	1	25	6	3	50
250,000-500,000	8	2	25	10	4	40
100,000,250,000	31	8	26	43	8	19
50,000-100,000	82	18	22	97	24	25
25,000- 50,000	167	32	19	216	31	14
10,000- 25,000	341	46	13	482	61	13
5,000- 10,000	338	31	9	542	59	11
2,500- 5,000	418	49	12	726	47	6
UNDER 2,500	5	1	20	13	2	15
GEOGRAPHIC REGION						
Northeast	256	34	13	451	55	12
North Central	492	52	11	699	86	12
South	352	44	13	619	56	9
West	294	58	20	366	42	11
FORM OF GOVERNMENT						
Mayor-Council	599	61	10	997	86	9
Council-Manager	721	114	16	1014	145	14
Commission	40	10	25	64	6	9
Town Meeting	27	2	7	47	1	2
Representative Town Meeting	7	1	14	13	1	8
LOCATION						
Central City	100	22	22	133	31	23
Suburban Unit	724	116	16	977	111	11
Non-Metropolitan Unit	570	50	9	1025	97	9

all municipal type services to the citizens of the City.* Since 1954, all thirty-two cities incorporated in the County have contracted with the County for a package of services. Most agreements are for a five year term.

A typical service package includes animal regulation, election services, emergency ambulance services, enforcement of city health ordinances, engineering services, fire and police protection, library, planning and zoning, street construction and maintenance, and street lighting. Certain services, such as animal regulations, are financed by fees.

Other services--fire protection, library, sewer maintenance, street lighting--are financed by means of special districts administered by the County. All other services are financed by direct reimbursement of county costs by the recipient cities.

Currently, seventy-seven cities in the County are parties to contracts with the County for the receipt of services. All seventy-seven cities receive election services under contracts, and all cities except Vernon contract with the County for state health law enforcement. And all cities but Santa Monica have contracted for the maintenance of city prisoners in the County Jail.

REASONS AND NEGOTIATION

Each recipient of the survey questionnaire was requested to "check the reason that best explains your decision to use an intergovernmental service agreement for the provision of the service." Eight reasons were listed -- (1) take advantage of economies of scale, (2) lack of facilities, (3) lack of qualified personnel, (4) meet an urgent problem, (5) citizen demand for service agreement, (6) take the service out of politics, (7) civil service avoidance, and (8) other. As Table 8 reveals, the principal reason for entering into agreements for the receipt of environmental services is to take advantage of economies of scale. The reasons, of course, vary according to the service involved. Lack of facilities, for example, is a more important reason for entering into a noise pollution abatement agreement than economies of scale.

Agreements in thirty-six percent of the reporting municipalities are negotiated by the mayor and council. The manager or administrator negotiates the agreements in thirty-four percent of the units, and the manager and council negotiate the agreements in twenty-six percent of the units.

*See the California Government Code, § 51301 and Los Angeles County Charter, § 56 1/2.

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TABLE 8

REASONS WHY MUNICIPA:ITIES USE INTERGOVERNMENTAL AGREEMENTS[1]

	Total Municipalities Reporting	Take Advantage of economies of scale (1)		Lack of Facilities (2)		Lack of Qualified Personnel (3)		Meet an Urgent Problem (4)		Citizen Demand for Service Agreement (5)		Take Service out of Politics (6)		Civil Service Avoidance (7)		Other (Specify) (8)	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
AP	112	74	66	44	39	28	25	8	7	1	1	1	1	0	-	12	11
NP	46	16	35	22	48	5	11	5	11	1	2	-	-	-	-	5	11
WP	111	37	33	37	33	15	14	12	11	-	-	-	-	1	1	9	8
RC	329	168	51	123	37	16	5	31	9	7	2	5	2	9	3	12	4
SD	306	164	54	93	30	13	4	40	13	3	1	2	1	0	-	18	6
SL	105	55	52	28	27	11	10	16	15	1	1	1	1	-	-	10	10
SW	283	155	55	101	36	11	4	35	12	-	-	1	-	1	-	8	3
WS	278	126	45	119	43	8	3	36	13	8	3	3	1	2	1	21	8
WD	126	51	40	43	34	5	4	11	9	2	2	5	4	-	-	18	14

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1 Percentages, when totaled, may exceed 100% since many respondents noted more than one reason.

2 Less than 1 per cent.

AP - Air pollution	SL - Sewer lines
NP - Noise pollution	SW - Solid waste disposal
WP - Water Pollution	WS - Water supply
RC - Refuse collection	WD - Water distribution
SD - Sewage disposal	

The mayor and council most commonly negotiate the agreements in cities over 250,000 population whereas the manager or administrator most commonly negotiates the agreements in cities in the 25,000 to 100,000 population category. This finding is in general accordance with the prevalence of these two forms of administration in municipalities in these two forms of administration in municipalities in these population categories.

EVALUATION OF AGREEMENTS

In fifty-six percent of the reporting municipalities the performance of the supplier of services is evaluated by performance measures established in the agreements. Sixty-five percent of the central cities, however, evaluate the services by means of periodic inspection by their personnel. This method also is used by fifty-two percent of the suburban communities and forty percent of the non-metropolitan communities. Levels of citizen satisfaction, as measured by the number of citizen complaints, are used by sixty-one percent of the central cities, fifty-eight percent of the suburban communities, and forty-eight percent of the non-metropolitan communities to evaluate the performance of the suppliers of services.

The vast majority of the recipients of services are satisfied with the service agreements as only 137, or six percent, of the 2,367 responding local governments have terminated agreements. Central cities (twelve percent) discontinued agreements with greater frequency than suburban municipalities (five percent) or municipalities in non-metropolitan areas (three percent). The small percentage of agreements terminated in the latter type of municipalities undoubtedly is due to the fact that these units have few if any alternative methods of providing or obtaining the services.

JOINT AGREEMENTS

Agreements for the joint provision of services and the joint construction and operation of facilities are relatively common. Union agreements differ from standard service agreements in that two or more governmental units join forces to provide the service or construct the facility, a joint body usually is created to administer the program, and each participant typically is a coequal partner.

Thirty-five percent of the reporting municipalities are parties to agreements for the joint provision of services. Larger units generally enter into these agreements most often--eighty percent of the units in the 250,000 to 500,000 population category and only twenty-seven percent of the units in the 2,500 to 5,000 category.

Conjoint service agreements are most common in the West (forty-nine percent) and least common in the South (twenty-eight percent). Forty-three percent of the council-manager municipalities participate in joint agreements compared to thirty-one percent of the commission cities and twenty-nine percent of the mayor-council cities. Not unexpectedly, central cities (sixty-two percent) enter into such agreements with greater frequency than suburban communities (thirty-nine percent), or non-metropolitan municipalities (thirty-one percent). In part, this finding is a reflection of the fact that the central city usually has more opportunities to enter into joint agreements, particularly with the county.

Twenty-one percent of the responding municipalities are parties to joint construction and joint leasing agreements. Once again, larger units have the greatest proclivity for participating in such agreements--sixty percent of the units in the 250,000 to 500,000 population category compared to fourteen percent of the units in the 2,500 to 5,000 categories. Council-manager units are nearly twice as likely to be parties to these agreements as are mayor-council cities. And more central cities (forty percent) sign these agreements than suburban governments (twenty-two percent) or non-metropolitan municipalities (eighteen percent).

Agreements for the joint leasing of equipment are relatively uncommon. Only fifty-five municipalities report that they are signatories to such agreements. Agreements for the loan of personnel or equipment are more common with fifteen percent of the reporting units parties to agreements of this nature.

SERVICES PROVIDED BY COUNTIES

In 1971, the Advisory Commission on Intergovernmental Relations, International City Management Association, and National Association of Counties cooperatively surveyed 3,047 county governments relative to services provided for individual local governments within each county on a contract basis, provided on a joint basis with local governments in each county, and jointly provided or under contract with another county.

As Table 9 reveals, one-third of the 848 reporting counties provide services on a contract basis to local governments located within the county. Although seventy-three percent of the reporting counties with a population over 500,000 provide contract services, these counties account for only 5.7 percent of the total number of service agreements. Interestingly, slightly more than one-quarter of the reporting counties providing services are in the 10,000 to 25,000 population class. This finding in part is a reflection of the greater number (998) of counties in this population class.

More than one-third of the responding counties provide services jointly with other local governments. As in the case of the contract services, joint service agreements are most common among counties in the 10,000 to 25,000 population class. This finding in part is a reflection of the

TABLE 9

COUNTIES SUPPLYING SERVICES ON A CONTRACT BASIS 1971

POPULATION GROUP	NUMBER OF COUNTIES	NUMBER OF RESPONDING COUNTIES	PROVIDE SERVICES		DO NOT PROVIDE SERVICES	
			#	%	#	%
Over 500,000	58	22	16	5.7	6	1.1
250,000-500,000	70	39	16	5.7	13	2.3
100,000-250,000	185	62	32	11.4	30	5.5
50,000-100,000	326	94	40	14.2	54	9.0
25,000- 50,000	566	153	48	17.1	105	18.8
10,000- 25,000	998	258	73	26.0	185	32.6
Under 10,000	844	230	56	19.9	174	30.7
Total	3,047	848	281	100.0	567	100.0

SOURCE: 1971 survey of county governments by the Advisory Commission on Intergovernmental Relations, International City Management Association, and National Association of Counties.

greater number (998) of counties in this population class.

Joint agreements with another county for the provision of services are relatively prevalent--226 out of 744 reporting counties have such agreements. These agreements also are most common in the 10,000 to 25,000 population class and in non-metropolitan areas.

INHIBITING FACTORS

"Limitations placed on independence of action by the agreement" was checked by nearly one-half of the reporting incorporated municipalities as the factor which has the most adverse effect on their willingness to enter into an agreement with another governmental unit to obtain services.

"Inequitable apportionment of the cost of the service" inhibited nearly one-forth of the municipalities from entering into agreements. The only other factor checked by a significant number of officials (nine percent) was "adverse public reaction to services presently being provided by another unit." Responses did not vary much by region, form of government, and central city, suburban, or non-metropolitan type.

The New Jersey County and Municipal Government Study Commission found "great hope in the fact that the overwhelming majority of officials in over 400 municipalities polled and interviewed are willing and anxious to enter into joint service agreements on a wide variety of areas."* Our national survey did not produce such optimistic data--478, or twenty percent, of the 2,383 reporting incorporated municipalities are contemplating entering into agreements with other units for the provision of services.

STATE AND FEDERAL ENCOURAGEMENT

Only forty-four of the respondents felt that the state constitution prohibits their municipalities from entering into agreements for the receipt of services or inhibits their ability to enter into agreements. A larger number (109) report that state statutes impede their ability to enter into service agreements.

Three-fourths of the reporting municipalities indicate that the state government actively encourages the intergovernmental provision of services. Forty-eight percent report that the state provides incentive grants-in-aid, forty-two percent mentioned financial assistance for studies, and fifty-six percent report the state provides technical assistance.

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*Joint Services: A Local Response to Areawide Problems, (Trenton: County and Municipal Government Study Commission, 1970), p. iv.

Only twenty-eight local governments felt that federal statutes and regulations restricted their ability to enter into agreements for services with another governmental unit. One-half of the respondents replied affirmatively to the question "Do federal statutes and regulations encourage intergovernmental contracting and cooperation?"

CONCLUDING COMMENTS

Incorporated municipalities over 2,500 population, according to our national survey, receive a significant number and a large variety of services from other governmental units and private firms under provisions of informal and formal agreements. More than three-fifths of the responding units receive services from other governmental units, yet most agreements are limited in scope and involve only a single service. This finding agrees with the finding of Vincent L. Marando that in the Detroit area "cooperative agreements entered into by a municipality were generally confined to one functional area. It did not appear that such agreements were generally confined to one functional area. It did not appear that such agreements were encouraging municipalities to cooperate with one another on a large number of varied functions."*

Service agreements would play a larger role in solving major environmental problems if a plan for the multilateral use of agreements was developed and promoted in each region by a metropolitan planning commission, council of governments, or the state. The widespread and successful use of multi-lateral agreements, however, would have three undesirable consequences.

First, a large number of agreements would complicate an already complex local governmental system and make it less comprehensible to the average citizen. This, in turn, will make it more difficult for citizens to pinpoint responsibility for failures of the local governmental system.

A second undesirable consequence of a proliferation of service agreements would be the reinforcement and perpetuation of the existing fragmented governmental system in the typical metropolitan area. Service agreements may make more difficult the creation of an areawide government with adequate powers to solve the major problems of the metropolis.

A closely related consequence may be the promotion of additional political fractionation and fiscal disparities in a number of metropolitan areas. Even the Advisory Commission on Intergovernmental Relations, a strong supporter of interlocal contracting, recognized "that under certain conditions such contracts can only further fragment unnecessarily the metropolitan tax base. The presence of nonviable 'paper' communities, incorporated under highly permissive state legislation and sustained by interlocal contracting arrangements, undoubtedly creates extremes of fiscal capacity or incapacity within certain areas."*

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*Vincent L. Marando, "Inter-Local Cooperation in a Metropolitan Area: Detroit," p. 199.

The cooperative or ecumenical approach to the solution of service problems will continue to be popular with local government officials in the future because the approach allows units to take advantage of economies of scale and has a minimal disruptive impact on local governments. And it is not unreasonable to forcast that most state governments will expand their efforts to encourage local governments to enter into service provision agreements and in special cases to order one unit to provide a service to one or more contiguous units.

Service agreements probably will continue to act as a safety valve in reducing the pressures for the establishment of a metropolitan government. If cooperation, however, fails to solve the major problems of the metropolis, pressure will be generated for the preemption of responsibility for solving problems by the federal and state governments.

One must not lose sight of the facts that not all governmental service problems lend themselves to solution by means of service agreements, and that the potential of intergovernmental cooperation is limited principally to the solution of relatively minor and non-controversial problems involving a small number of local governments.

We conclude by pointing out that increasing metropolitan scale and development of megalopolises limit severely the ability of interlocal cooperation to solve major areawide problems and will increase the pressure for the upward shift of responsibility for problem solving.

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*Fiscal Balance in the American Federal System: Metropolitan Fiscal Disparities. Vol. 2 (Washington, D.C.: Advisory Commission on Intergovernmental Relations, October 1967), p. 15.

MANAGING AT THE LOCAL LEVEL

Mark E. Keane*

Environmental management is one of the most intriguing public issues. It has about it a spirit of hope which is otherwise in short supply today. There is a sense of being in on the beginning of a great battle on behalf of society.

There are ten points on the nature of environmental management and the need for a strong local government in the "New Federalism" that I feel are important and should be discussed. They are as follows:

Point 1. This conference is typical of the environmental movement in the variety of speakers you have heard. The academic community is well represented along with all levels of the government -- Federal, state, county, metropolitan, and city. The private business sector has been represented too, although probably not in adequate strength commensurate with their importance. From the White House to the Courthouse we have looked at this strange creature known as the environment. And that is the only way we will make progress back in our home communities -- by getting together like this.

Point 2. The environmental struggle needs constant attention from the media, not only when it stages a dramatic crisis or demonstration. The papers, radio, and TV need to be educated to the issues, the problems, and the potentials, even as we do.

Point 3. The dimension of race is a pervasive influence in all the problems of current American society. No matter how we may measure the quality of life in our nation or in our community, we need to establish a base point monitoring system on those who have been short circuited in the affluence of the rest of society.

Point 4. Politics determines the environment. We have faced the enemy of pollution: how can he be defeated? - by the government, or federal, state, and local working together. They will allow the citizen to express himself and they will heed the computers and the system analyses of their professional staffs and of the academic community. And who is they? It is the elected leaders, from the President of the United States to the trustee of the smallest village. We know by now that they are human and uncertain, and often tired and weak, even as we are. We do not generally understand,however, the tremendous stress and pressure of elective office today. We do not adequately analyze how the elected official may be helped and supported in making those decisions we may think are so right and so necessary. But they must and will make the decision, even if the decision is to do nothing.

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*Presented by Mark E. Keane, Executive Director, International City Management Association, at the National Conference on Managing the Environment.

Point 5. We adapt to the environment at the local level. It's so obvious -- "you've made your bed, now lie in it." In the cities, the complex jargon and the sophisticated interrelationships of the ecosystems translate to plain sensory shocks: stinks, worms, rats, mud and flood, backed-up sewage, messy garbage, ugliness, noise, sickness, coughs, jams and delays, ad nauseum. This is the way you feel it, the way I feel it. These are insults to the senses that are largely controllable by community action, given the essential national foundation of basic law, commitment and resources.

Point 6. National strategy should aim at creating the climate for energizing local initiative. The results will be uneven, but there will always exist a basic need for diversity and freedom of choice. The goal is to achieve an ever-rising minimum standard, not some ideal equality and purity.

Point 7. At the local level, this point of most important action, decisions are difficult to come by. The people are there. They see, feel, touch, taste, and smell what their local officials do to them. City Hall and the Courthouse are within reach. No long distance toll charges are necessary. Decisions are less likely to be dramatic or revolutionary, less likely, in fact, to deal with ego-systems. They move incrementally. Comprehensive plans are generally ignored, while a change in zoning on one single lot may fill the council chambers for a public hearing. So, do we surrender to destruction of the environment while constructive change moves at such a local pace? This may be. Or, we may evolve a science of political action that permits such involvement at the local level while reshaping the basic framework at regional, state, and federal levels.

Point 8. Political leadership at the local level needs to build, develop, and sustain the best talent available as staff, to help them understand and analyze the environmental issues. Not even a sign ordinance is simple; a water bill is potential dynamite; a garbage bag will break in your face. A local elected official needs the help of well trained, broad-gauged advisors, who will help evolve policies that will actually work to achieve the original objective. They need to be organized in new ways that integrate their viewpoints, ways that bring them out of their functional specialities, a climate of interrelationships that focuses their attention on the common problem and away from their particular departmental kingdoms.

Point 9. The technological capacity to deal with environmental issues cannot reach local governments today through the traditional channels. Field representatives of federal or state agencies and private consulting firms are helpful, of course, but in most cases they have a standard product to sell. New kinds of institutions will be created by local governments to serve their special needs. An example is Public Technology Incorporated, which has been organized by the national associations, such as ICMA, representing state and local government. PTI is designed to serve as the vehicle for facing the local governments' problems against the technology of the universities and of industry. The software and hardware products developed through this constant interface of producer and consumer will constitute an important part of the capacity of local government to meet environmental needs.

Point 10. We have postulated much about citizen involvement in the decision-making process. We have concluded that it is vital. We reach the same conclusion on every public issue. A public official welcomes public participation when it tends to support the ongoing process of government, but tends to wish it would go away when seemingly essential projects are stopped dead or when decisions seem forever delayed. You in public life at the front lines in local government know there is no formula, no pat solution. It is the essence of the local political process. However, there has been too little effort to help the politican bridge the gap of understanding between him and his voters. Those who hope to improve the effectiveness of citizen involvement need to develop a strategy in each community, one that best fits its political traditions. Frontal assault will be necessary in some, while in others city hall will gladly join with the citizens as a team if the method and the motivation is carefully and wisely developed.

The environment, perhaps more than any other issue, requires intergovernmental solutions. It is important therefore that an appropriate role for the federal, state and local levels be defined and adhered to. The direction of the "New Federalism," as exemplified in general revenue sharing and the proposed special revenue sharing, has rightly placed greater responsibility back in the local level. The local government official will make or break this great national effort. We need to continue this process of helping him, respecting him, and most importantly, listening to him.

environment

National Conference on Managing the Environment

May 14-15, 1973
Ramada Inn
Washington, D.C.

Sponsored by
The U. S. Environmental Protection Agency
Office of Research and Monitoring
Environmental Studies Division
Administered by
The International City Management Association

A-1a

NATIONAL CONFERENCE ON MANAGING THE ENVIRONMENT

Conference Chairman

Stanley M. Greenfield
Assistant Administrator, Research and Monitoring
U. S. Environmental Protection Agency

AGENDA

SUNDAY, May 13

2:00	Registration	Lobby
4:00	Environmental films	Royal Suite
7:00	Film "Pollution is a Matter of Choice"	Royal Suite
8:00	Registration Closes Informal Mixer	Esplanade
10:00	Mixer Ends	

MONDAY, May 14

8:30	Welcoming Remarks: Stanley M. Greenfield Keynote: RUSSELL TRAIN (Chairman, Council on Environmental Quality)	Normandy-Savoy
9:00	THE ENVIRONMENT: HOW COMPREHENSIVE? A discussion aimed at expanding traditional perceptions of the scope of environmental management concern from the varying viewpoints of a theoretical planner, a state planning director, and a multidisciplinary ecologist. MODERATOR: Ralph Tabor (Director, Federal Affairs, National Association of Counties) 1. "Comprehensive Planning" Ian McHarg (Professor, University of Pennsylvania)	Normandy-Savoy

2. "The Economics of Ecology"
Kenneth Boulding (Professor, University of Colorado)

3. "Planning for Quality Growth"
Shelley Mark (Director, Department of Planning & Economic Development, State of Hawaii)

10:30 BREAK

10:45 INTERACTION AT THE LOCAL LEVEL Normandy-Savoy

Focusing on the issues of both economic and social costs, this session will consider interaction among key actors on the local scene.

MODERATOR: Walter Scheiber (Director, Washington Metropolitan Councils of Governments)

1. "Public Needs and Private Concerns in the Environment"
Arthur Busch (EPA Regional Administrator, Dallas, Texas)

2. "Costs of Pollution"
Joseph Fisher (President, Resources for the Future)

3. "Corporate Responsibility and the Environment"
Ernest Starkman (Vice President, General Motors Corporation)

4. "Community/Industry Relations on the Local Level"
Stephen May (Mayor, Rochester, New York)

12:30 LUNCHEON: Earl S. Mackey (Executive Director, National Legislative Conference) Dauphine-Brittany

ADDRESS: Robert Fri (Acting Administrator, Environmental Protection Agency)

"Beyond the Brushfires"

2:00 **A DECISION-MAKER FACES THE ENVIRONMENT** Normandy-Savoy

This discussion attempts to focus on the process decision-makers employ in translating broad goals and comprehensive plans into action programs at the local level.

MODERATOR: Morris William Collins (Director, Institute of Government, University of Georgia)

1. "Incrementalism and Environmentalism"
   Charles Lindblom (Professor, Yale University)
2. "Managers and the Environment"
   Lynton Caldwell (Professor, Indiana University)
3. "Environmental Decision Making"
   Peter Wilson (Mayor, San Diego, California)
4. "Industrial Involvement in the Decision-Making Process"
   J. L. McClintock (Director, Environmental Resources, Weyerhaeuser Company)

3:30 BREAK

3:45 WORKSHOPS

A. **LOCAL GOVERNMENT EXPERIENCE** Normandy-Savoy

Discussants exchange practical experiences gained in local communities.

1. "How a City Government Organizes to Handle the Environment"
   Herbert Elish (Administrator, Environmental Protection Administration, City of New York)
2. "A Team Approach to Environmental Management"
   Beverly Briley (Mayor, Nashville, Tennessee)

3. "Local Government Perceptions Regarding the Environment"
   Richard Gray (City Manager, Norman, Oklahoma)

B. REGIONAL GOVERNMENT EXPERIENCE Brittany
Discussants exchange practical experiences gained in regional settings.

1. "Alternative Regional Arrangements"
   Joseph Zimmerman (Professor, State University of New York, Albany)

2. "Supporting County Planning"
   Edwin Coate (Director, IREM Project, San Diego, California)

3. "How a Regional Organization Assumes Environmental Responsibility"
   Robert T. Jorvig (Executive Director, Metropolitan Council, St. Paul, Minnesota)

4. "Regional Planning and Implementation"
   Richard Hartman (Executive Director, National Association of Regional Councils)

C. TECHNICAL WORKSHOP ON SAN DIEGO/IREM PROJECT Royal Suite

5:15 BREAK FOR DINNER

7:15 WORKSHOPS

A. LEGAL AND JUDICIAL CONSTRAINTS Brittany
The legal aspect of environmental management is addressed by a panel representing the spectrum of involvement by the legal profession.

1. "The Law and the Environment"
   Frank Grad (Professor, Columbia Law School)

2. "The State Role in Environmental Enforcement"
   Henry Lord (Deputy Attorney General, State of Maryland)

3. "Enforcing Environmental Law in the City"
   Norman Redlich (Corporation Counsel, City of New York)

4. "The Role of Industry in Environmental Law"
   Everrett H. Bellows (Vice President, Olin Corporation)

5. "Citizen Participation in Making Environmental Law"
   John Dienelt (Environmental Defense Fund)

B. PUBLIC INVOLVEMENT IN ENVIRONMENTAL PROGRAMS — Dauphine

Discussants focus on the problem of educating the public to gain support for extensive environmental programs.

1. "The Voice of the Citizen"
   Ruth Clusen (League of Women Voters)

2. "Citizen Participation in Environmental Management"
   Gerald Springer (Deputy Mayor, Cincinnati, Ohio)

3. "Creating an Environmental Awareness"
   George Schrader (City Manager, Dallas, Texas)

4. "Implementing Citizen Participation"
   John Goodman (Technical Assistance Research Programs)

C. TECHNICAL WORKSHOP ON ARIZONA TRADE-OFF MODEL (ATOM) — Royal Suite

D. TECHNICAL WORKSHOP ON GENERAL ENVIRONMENTAL MODEL (GEM) — Savoy

8:45 ADJOURN

TUESDAY, May 15

8:30 Welcoming Remarks: Stanley M. Greenfield — Normandy-Savoy

Keynote: SENATOR HIRAM L. FONG (Hawaii)

9:00 ENVIRONMENTAL TECHNOLOGY Normandy-Savoy

New technological developments and experiments provide new tools for environmental managers.

MODERATOR: Allen Pritchard (Executive Vice President, National League of Cities)

1. "A National Environmental Assessment Model"
   Stanley M. Greenfield (Assistant Administrator for Research and Monitoring, EPA)

2. "Arizona Trade-Off Model"
   C. W. Myers (State of Arizona)

3. "Communications in Environmental Management"
   Rodman T. Davis (Metropolitan Regional Council, New York City)

4. "A Statewide Environmental Data Information Center"
   Robert Garner (Oklahoma Environmental Information Center)

10:30 BREAK

10:45 WORKSHOPS

A. GROWTH Normandy

Effective environmental management must be achieved in the context of a dynamic society characterized by rapid and uneven growth. This discussion centers on questions relating to growth-associated problems and their effect on environmental managers.

1. "The Concept of Carrying Capacity"
   A. Bruce Bishop (Professor, Utah State University)

2. "Regional Concerns in Growth Patterns"
   Francis T. Mayo (EPA Regional Administrator, Chicago, Illinois)

3. "Land Use Controls"
Roger Hansen (Executive Director, Rocky Mountain Center on the Environment)

4. "Limiting Growth"
Martin Johnson (Secretary, Agency of Environmental Conservation, Vermont)

5. "Managing for Controlled Growth"
William Lamont (Acting City Manager, Boulder, Colorado)

10:45 B. STANDARDS AND THE ENVIRONMENT Esplanade

A representative sampling of new techniques being considered or developed for use by environmental managers. Much of this effort is supported by EPA research funds.

1. "Single vs. Variable Standards"
Robert Pikul (MITRE Corporation)

2. "Performance Standards"
Frank Beal (American Society of Planning Officials)

3. "The Translation of Federal Environmental Standards into a Local Enforcement Program"
Jack E. Ravan (EPA Regional Administrator, Atlanta, Georgia)

4. "The State/Local Interface"
William L. Blaser (Former Director, Illinois Environmental Protection Agency)

10:45 C. COMPREHENSIVE PLANNING Savoy

Methods of analyzing the effects of particular events within the framework of a comprehensive plan.

1. "Total Impact Analysis"
Douglas W. Ayres (City Administrator, Inglewood, California)

2. "The Impact Statement and the Comprehensive Plan"
Robert C. Einsweiler (American Institute of Planners)

3. "Resource Recovery Considerations for the Planning Process"
   Richard Lesher (President,
   National Center for Resource Recovery)

4. "Regional Comprehensive Planning and the Environment"
   Gerald T. Horton (President,
   Georgia House of Representatives)

D. TECHNICAL WORKSHOP ON STRATEGIC ENVIRONMENTAL ASSESSMENT SYSTEM (SEAS) — Royal Suite

12:30 LUNCHEON — Dauphine-Brittany

2:00 IMPLEMENTING THE ENVIRONMENTAL MANDATE - INTERGOVERNMENTAL RELATIONS — Normandy-Savoy

Discussants, representing public administrators at all levels, will focus on the implementation of environmental plans and programs. Intergovernmental relations and responsibilities are a prime concern.

MODERATOR: John Quarles (Acting Deputy Administrator, EPA)

1. "Balancing Competing Goals"
   Richard M. Fairbanks (Associate Director,
   Domestic Council)

2. "The Role of the Federal Regional Councils in Environmental Management"
   Gary Baise (Director,
   Office of Legislation, EPA)

3. "Regional Mandates and the Environment"
   John A. McGlennon (EPA Regional Administrator,
   Boston, Massachusetts)

4. "State Responsibility in Managing the Environment"
   Dan W. Lufkin (Commissioner,
   Department of Environmental Protection,
   Connecticut)

5. "Managing at the Local Level"
   Mark Keane (Executive Director,
   International City Management Association)

4:00	CLOSING REMARKS:	John Quarles (Acting Deputy Administrator, Environmental Protection Agency)	Normandy-Savoy
4:30	ADJOURN		

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